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Power Station Staffs' Salaries

Distribution Bill holding up revision

THREE years ago the National Joint Board of Employers and Members of Staff for the Electricity Supply Industry agreed on a supplementary schedule of salaries which took the place of the original schedule instituted in 1923. The 1923 schedule was subject to adjustment according to fluctuations in the cost of living but it was agreed that the salaries specified in the supplementary schedule should be stabilised for a period of three years, terminating on July 31st, 1938. At the same time three new classes of stations of more than 150,000 kW were added and "service" increments were given after periods of two and four years.

Under the original agreement a cost-of-living datum of 125 per cent. above the July, 1914, level was adopted and it was stipulated that for each complete rise or fall of 5 per cent. from this figure over a six-months' period there should be increases in or deductions from the salaries set out in the schedule. When the supplementary schedule was drawn up in June, 1935, the average cost-of-living figure for the first half of the year was about 40 per cent. above the July, 1914, level, a fall of 85 per cent. from the datum, which meant a deduction from salaries of seventeen cycles of five points.

It was provided, however, that there should be a general increase, and so the deduction from the basic salaries was limited to thirteen cycles of five points. It was apparently thought that the cost of living would remain fairly constant during the three-year period. Actually it immediately commenced to rise until in the latter half of 1937 it averaged about 57 per cent. above the 1914 level.

Thus power station engineers were no better off than when the supplementary schedule was introduced and as a result the staff side of the N.J.B. put in a claim for an upward adjustment. To this the employers' side would not agree and instead proposed that the salaries should remain at the existing level until the end of the current year. No agreement could be reached and so there was nothing for it but to revert to the cost-of-living adjustment as from August 1st. By a coincidence the average level of the cost-of-living figure for the first half of the year is 56.2 per cent. which means that for the ensuing six months the salaries set out in the supplementary schedule remain unaltered.

Thus it would seem that the employés, while they have enjoyed higher rates during part of the past three years, are now back on the old basis with which they were dissatisfied. There is, however, some compensation in the "service" increments which are retained and, as regards the members in the largest stations, in the extended classification.

The main question, the revision of the whole basis of the original agreement, remains untouched. The need for a revision, as we pointed out in our issue of April 29th, is very apparent. The structure of the electricity supply industry has been radically altered by the operations of the Central Electricity Board under the 1926 Act. The tendency has been to close small stations or operate them intermittently and as a consequence more and more men have left the stations for the distribution side. The schedule was designed principally for station men and on a station capacity basis. But even station men are not satisfied as the correspondence which followed our leading article showed. Shift charge engineers, particularly, have grievances.

The staff members of the National Joint Board also proposed that the Negotiating Committee should resume its investigations into the matter of revising the original agreement in October and report to the Board in February next. The employers were opposed to any immediate action, considering that it was unwise to make any basic alterations while the industry was in a state of uncertainty. The new legislation would probably cause radical changes which made it inexpedient to amend the schedule without a fuller knowledge of what was going to take place.

And so the matter is left in the air, as many other matters have been, on account of the delay in bringing forward the Distribution Bill. It provides yet another reason for the Government to make some move or definite statement.

What About Distribution?

IN commenting a few weeks ago on the I.M.E.A. discussion regarding the reorganisation of distribution, we urged publicly owned and company undertakings to make the most of the present breathing space by trying to work out together a live-and-let-live scheme on which to base the projected Bill. This week Mr. H. M. Sayers sets out the main points that would fall to be discussed by a joint committee representing all sections of Electricity supply. Even if after every attempt to reconcile conflicting views and every honest endeavour to place first the interests of the consumer (which means, also, the ultimate prosperity of the industry) have been made, there remain points upon which the parties can only agree to differ, it will be all to the good to have these defined, after careful consideration, in a clear-cut manner. There will, we believe, be no disagreement that the outlook expressed by the restrictions imposed in the early Electricity Supply Acts, no less than the restrictions themselves, must go.

Getting Together

TRAVELLERS in trams and buses in provincial towns often see advertisements by the local electricity supply authorities, generally consisting of the monotonous repetition of the words "Use Electricity!"—an unconvincing sort of publicity. Occasionally the more enlightened authorities make a splash and employ really telling advertisements. We have great hopes of the campaign which has been arranged jointly by London Transport and the London supply undertakings. A sum of £25,000 is involved, and for this amount a good show should be assured. If posters are to be employed we hope that the Transport Board will be consulted, so that we may see electrical displays as good as some of those of the Board itself. In any event, credit is due to the committee which has been working on the plan under the chairmanship of Mr. A. E. McKenzie, borough electrical engineer of Wimbledon, and to Mr. J. D. Spark, the Willesden engineer and manager, and Mr. H. J. Randall, of the City of London Electric Lighting Co., Ltd., who were responsible for the preliminary work.

Mains in Roads

PUBLIC utility authorities who break up roads for the purpose of laying mains are governed by the Gasworks Clauses Act of 1847 in the matter of giving notice, guarding excavations, and reinstatement. Now 1847 was a long time ago and the nature of roads and the amount of traffic on them has altered considerably, and it is surprising that the matter of revising the requirements has not received prominence before this. It has been raised in Parliament by a clause which the West and North Riding County Councils wish to be inserted in the West Yorkshire Gas Distribution Bill. The Select Committee which is considering the Bill is in favour of such a clause, but the Minister of Transport said earlier, on the second reading, that he would consult other Government Departments concerned, and a Ministry representative told the Committee that his Department hoped that trunk roads would be covered by such a clause. The matter is one which electricity supply authorities should watch closely, lest too-onerous conditions should be imposed upon them.

Coal v. Water Power

THERE is no novelty in the prediction contained in Mr. H. Clark's presidential address to Section A of the South African Association for the Advancement of Science that a country able to produce power at a cost considerably lower than that ruling to-day would tend to attract large industries. Nevertheless, his estimate of the effect of cheap electricity on the prospects of a country in developing large-scale industries is very much to the point at the present time. His expectations rest upon low-priced coal and not upon hydro-electricity, with its high capital charges. As he states, probably the majority of the most favourably situated water-power sites have already been developed and technical advances in steam generation will enable coal to compete with it on increasingly favourable terms. In having a falling trend in coal prices South Africa is especially fortunate. Mr. Clark evidently expects this trend to be maintained, as he does also the rising coal prices in Great Britain, since his proposals are largely based upon the economic export to this country of electro-chemical and metallurgical products now imported by us from water-power countries. Most of these are essential to national prosperity; many to national security. It may be that conditions in this country will continue to militate against the acquisition of all of the enormous electrical loads which such products imply, but there are others, and Mr. Clark's address gives an indication of how great may be the ultimate effect of fractional differences in the price of coal upon the direction of industrial development.

Self-help?

IN our last issue we referred again to the milking of municipal electricity surpluses to reduce local rates. At Portsmouth last week we again had the matter brought to our attention. At a gathering in connection with the inauguration of the new plant at the city electricity works the Lord Mayor called upon the assembled citizens to use more electricity and in that way reduce the rates. This somehow recalls the case of the parsimonious father who persuaded his small son that the penny-in-the-slot gas meter was a money box. Apparently they order these things no better in South Africa, for Mr. Clark, who is mentioned above, says that there is necessity for legislation to prevent authorities subsidising the rates from electricity revenues. He mentions one city in the Union which took 31 per cent. of the *gross* surplus.

Domestic Diversity

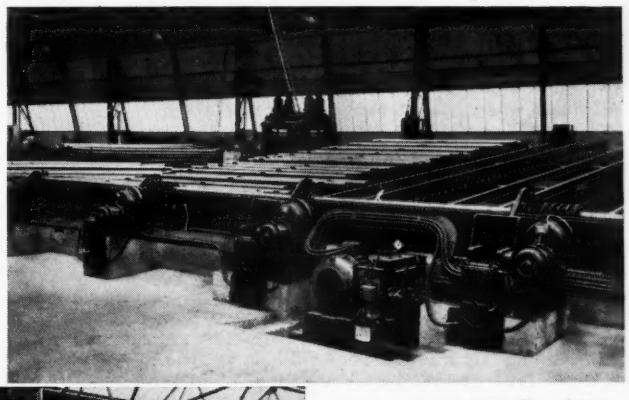
SOME interesting comments on domestic electrical development are contained in the annual report for the past year of Mr. H. G. Fraser, the city electrical engineer and manager at Oxford. Since 1933 the load factor of the undertaking has improved from 17.96 to 33.14 per cent. This, following very clearly the increase in domestic equipment installed, he says, proves the very large diversity in the use of this class of apparatus among different consumers. Certainly the use of electrical appliances in Oxford homes has grown remarkably in recent years. A table in the report gives the number of cookers, water-heaters, etc., installed at the end of March last as 11,950, against nil in 1933. In looking for means of obtaining a still larger share of the available business by further cheapening the supply, the engineer has recently had under consideration various systems of remote central control for switching off certain types of domestic apparatus, such as water-heaters, at times of peak load. Apart from the system itself, however, this involves the serious question of whether the consumer is likely to be inconvenienced at all by such a procedure.

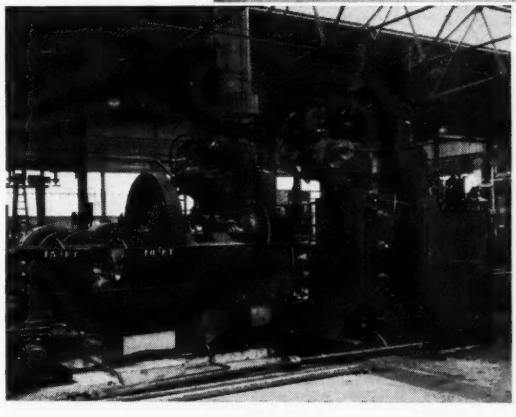
Public Lighting

ONE of the reminders that another lighting season is not very far away is the appearance of the programme of the annual conference of the Association of Public Lighting Engineers, particulars of which are given in this issue. The place of this year's gathering (the fifteenth) is Bournemouth and the delectable county borough is "going all out" to make the event a success. The president is Mr. C. H. Woodward, A.M.I.E.E., the public lighting engineer of Bournemouth; and the borough electrical engineer, Mr. J. K. Brydges, M.I.E.E., is to contribute to the proceedings, jointly with Mr. N. Boydell, A.M.I.E.E., a description of the lighting methods adopted by Bournemouth. Thirty manufacturers of street lighting equipment are to participate in the exhibition which will be held at the Town Hall.

New Jarrow Tube Works

A high-grade product is obtained by means of modern equipment in which electric drive finds many applications. For bright annealing very high quality tubes a special electric furnace is being installed





[*Elec. Rev. photos.*

Above: A cooling bed, showing throw-over drive, "Eldro" clutch drive and individual roller drives. Left: The pilger mill, showing main and fine rolls adjustment motors (top) and a saw drive (bottom)

THE new factory of Jarrow Tube Works, Ltd., which we recently visited represents a great advance in high-grade tube production, largely on account of the precision control of the product during the various processes of manufacture in which electric drive and its control play an important part. The plant is designed for the manufacture of hot-finish, cold-drawn weldless to fine limits and bright-annealed tubes up to 3½ in. in outside diameter.

Solid billets up to, say, 7 in. diameter and 4 ft. long are received as raw material for the tube works from the associated company, Jarrow Metal Industries, Ltd., and for reducing these to the required working lengths, when necessary, there is a special saw which will cut through a 6-in. billet in 50 seconds. The feed against the stationary billet is operated hydraulically and the saw is driven by a 10-h.p., 1,440-r.p.m. squirrel-cage motor.

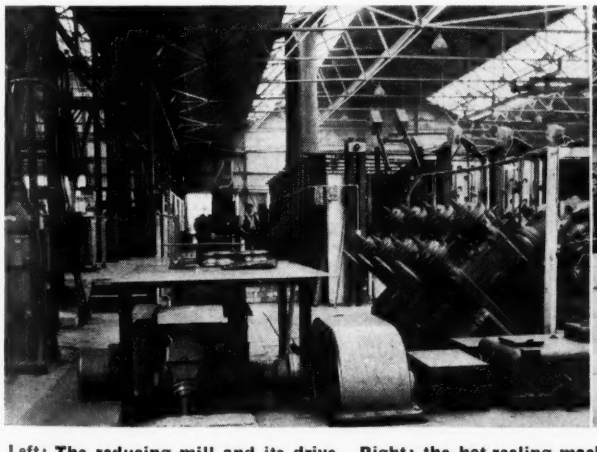
After suitable heating the red-hot billet is dealt with by a piercing mill which both rolls the billet and pierces a hole longitudinally through its centre. While in the rolls the billet is rotated and at the same time driven forward against a plug which is pushed through the metal by compressed air. The rolls are driven by a 720-h.p., 5,500-V continuously running slip-ring motor which is served by a liquid starter. A grease pump which feeds the roll bearings is push-button controlled from the operator's platform above the rolls.

The Pilger Mill

The tubular billet is then pilgered or rolled to tube over a mandrel. The feed into the rolls of the pilger mill is by the ramming operations of a hydraulic plunger, thus imparting a definite forging action which is beneficial to the metal. While the plunger is operating the hydraulic carriage gradually moves forward, thus maintaining the water pressure. There are three zones in the pass of the pilger rolls—clearance where the feed is made, working which forges the billet to correct thickness, and finishing which directly sizes the outside diameter of the tube. The rolls of this mill are driven by a 540-h.p., 600-V variable-speed d.c. motor, 600/1,200 r.p.m., with transmission through a four-to-one ratio reduction gear. Ward Leonard control is provided for this mill drive by means of a separately excited motor-generator set with a 660-h.p., 5,500-V, 980-r.p.m. s.r. motor and a 450-kW, 600-V generator. Excitation is at 220 V.

The wide speed range is demanded by the varying sizes of tube produced—the smaller the tube the faster the rolls—and very accurate adjustment of the rolls is provided for. Further, whatever the size of the tube produced the end which accommodates the hydraulic feed plunger remains the size of the billet and so the rolls have to be lifted each time to allow the end to pass through and reset again every time a tube is made. There are two 10-h.p. slip-ring main screw-down (adjustment) motors with contactor control and two small motors for fine adjustment. Connected across the stator windings of each screw-down motor is a solenoid which, when energised, throws in a clutch on the rolls side of the drive. When the clutch is out the motor runs light and screw-down ceases.

The pilger-mill motor bearings are water cooled on a circulatory system incorporating a pump and a fan each with a ¼-h.p. motor drive, and these motors, the roll-bearings grease-pump motors and the reduction-gear oil pump motor are all interlocked electrically with the main mill driving motor. All the auxiliaries must be running before the mill driving unit can be started.



Left: The reducing mill and its drive. Right: the hot-reeling machine; straightening roll drives to the left and pinch roller to the right [*Elec. Rev. photos.*

The pilgered tube is drawn from the mill by pinch rolls which are separately driven by a small motor, but the grip is effected hydraulically. When it is passed to the required distance clear of the mill the tube is "thrown" over hydraulically on to a roll table conveyor with individually driven rolls. Altogether there are fourteen roll drives arranged in two groups of seven. There is one control for each group and all the motors are connected in parallel. The conveyor first takes the tube to a saw to be cut to required lengths and then carries

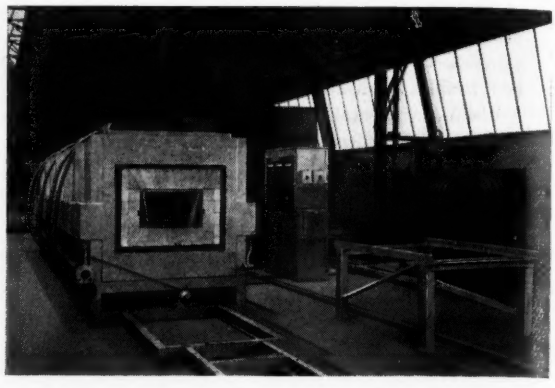
the lengths on for transfer to cooling beds. The saw is directly coupled to the 1,450-r.p.m., 20-h.p., 440-V, squirrel-cage continuously running driving motor with star-delta starting.

The throw-over to the cooling bed is effected by a 7½-h.p., 960-r.p.m., squirrel-cage continuously running motor, but there is a separate oil-pressure clutch operation with its own electric drive and control. The main motor drives a shaft on the "free" side of a clutch and engagement of the clutch is effected by a piston which operates under oil pressure supplied by the small motor pump. The pump motor is push-button controlled from a platform from which the saw, run-out gear and cooling bed motors are all governed.

On the cooling bed the tubes are gradually carried up an incline by endless chain conveyors which are driven through large-ratio reduction by a 13½ h.p. motor. At the top of the incline they fall into a rack from which they are conveyed either to the cold-drawing or hot-finishing section.

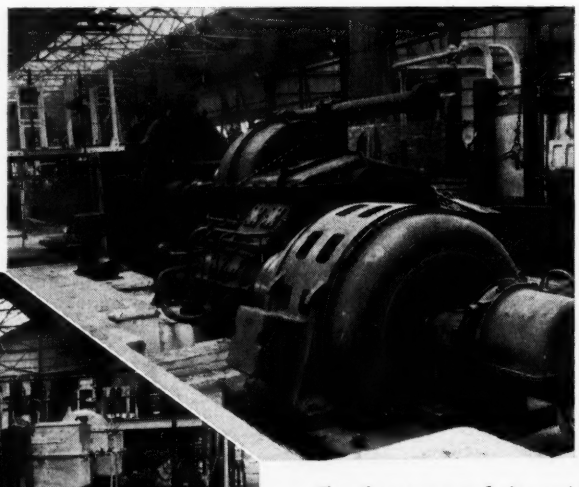
For cold drawing the ends of the tubes are first hot tagged or swaged to provide the necessary grip for the dogs in the draw benches. There are five working units on the tagging hammer, all driven by cams on a shaft at the top of the machine which has a multiple V-belt drive from a 15-h.p., 720-r.p.m., squirrel-cage motor served by a star-delta starter. Annealing the tubes is necessary before cold drawing and also between "passes," and after such treatment in a gas-fired furnace the tubes are pickled in acid to remove the scale.

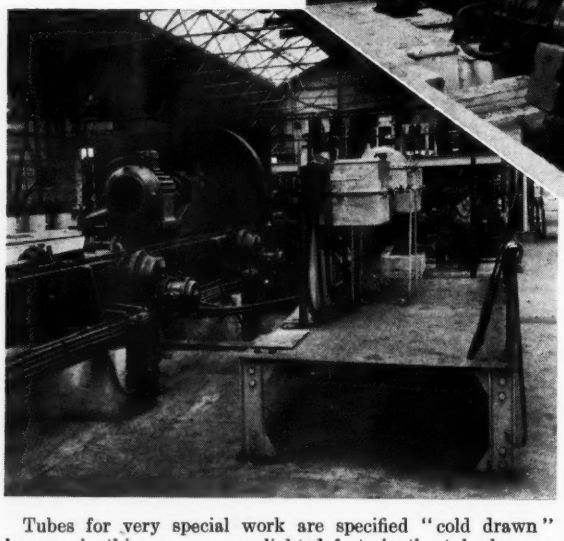
For bright annealing very high quality tubes, however, there is now being erected a special electric furnace. Annealing takes place in a controlled atmosphere in the heating chamber which measures about 30 ft. long and 24 in. wide and 18 in. high inside. Top and bottom ribbon elements are provided and the total load is 220 kW. The normal operating temperature of about 800 deg. C. is automatically controlled by pyrometer. The resistor banks in the three heating zones are separately contactor controlled and are supplied at 154/89 V from a 250-kVA, 5,500-V transformer. The total length of the furnace complete with the run-out equipment is 171 ft. The furnace is designed to handle tubes up to 3½ in. in diameter and 20 ft. long with an output of 16-17 cwt. per hour.



[*Elec. Rev. photo*

Electric bright-annealing furnace in course of erection





Below: A tube saw, with control platform for saw, run-out gear and cooling bed. Right: Piercing mill from driving end, with control platform to the left [*Elec. Rev. photos.*

Tubes for very special work are specified "cold drawn" because in this process any slight defects in the tube become exposed. The hot-rolled tubes are drawn through accurately machined dies by very heavy chains with motor drives. A 30-ton single draw bench has a 50-h.p., 720-r.p.m. slip-ring main motor and a 15-h.p., 960-r.p.m. squirrel-cage pilot motor drives. The pilot motor is first used to put the dog into the ready-for-draw position. When the tagged end of the tube has been pushed through the die and gripped by the dog and the hooks on the dog have been lowered to engage with the chain, then the main motor is switched on. With the "make" of the first contactor on the main motor circuit the pilot motor is automatically cut out of circuit and the tube is drawn through the die under the influence of the big motor only. We saw also some 20-ton double-chain draw benches with only one drive by a 45-h.p. slip-ring motor. The drawn tubes are cut on individually driven lathe-type machines.

The alternative method of finishing hot rolled tubes is by hot reducing, the pilgered tubes from the cooling beds being first treated in a reheating furnace through which they are pushed into the reducing mill by pusher-arm equipment at the opposite side of the furnace. This is driven by a 20-h.p. slip-ring reversible motor operated by a steelworks-pattern reversing controller *via* contactor gear. The reducing mill, which is served by a 135-h.p. slip-ring continuous-running motor, has eight sets of rolls set at 90 deg and reduction in outside diameters of 40 per cent. can be effected.

By a raising and lowering platform the reduced tubes are passed along to a hot reeling machine which removes scale and straightens the tubes. The up and down motions of the platform are effected by a 10-h.p. slip-ring motor, but the actual conveyance of the tube is by means of three individually motor-driven rolls on the platform itself. The two rolls of the hot-reeling machine are set at a slight angle from the line of the tube and they are each driven separately by a 20-h.p. slip-ring variable-speed motor. At the "exit" end of the reeling machine is a set of pinch rolls which sends the tube forward into an enclosure on a compressed-air operated table which "throws" the tube over to the cooling bed. One roll only of the pinch rolls is driven—by a 10-h.p. motor. The other roll provides just sufficient grip on the tube without distorting it, and adjustment is effected by a solenoid.

For the compressed-air services there is a compressor with a capacity of 100 cu. ft. of free air per min. driven by a 22-h.p. slip-ring motor. By means of a diaphragm pressure switch connected to the air receiver the motor is automatically cut out when the air pressure is 100 lb. per sq. in. and is switched on when the pressure falls to 75 lb. per sq. in. The 110-h.p. slip-ring motor driving the pumps for the hydraulic services is operated automatically by trip switches on the accumulator. The total h.p. of the motors installed throughout the mill is about 3,000, and there are about 100 auxiliary drives.

A lighting intensity at the working plane of 9.5 ft.-candles is maintained, although the total works lighting load is only about 40 kW. This is accounted for by the extensive use of mercury-vapour lamps of which there are seventy-nine 400-W units in dispersive reflectors arranged in two overhead lines in the main bay. These are supplemented by a line of angle reflectors at each side below the crane rails. In the side bay there are another fifteen discharge lamps of the same size, while outside similar lamps serve the storage space.

Electricity is received at 20 kV from the North-Eastern Electric Supply Co.'s system and is reduced to 5,500 V by a 2,750-kVA transformer. A six-panel high-voltage works distribution switchboard serves the piercing-mill motor, the Ward Leonard motor-generator set for the pilger mill, two 450-kVA transformers for the 440-V auxiliary motors and the electric furnace transformer. There is also a nine-panel distribution board for the auxiliary motors and the lighting. Nearly all the electrical equipment was supplied by the G.E.C.

Our thanks are due to Mr. William Scott, managing director, and to Mr. J. J. Craig, electrical engineer, for their help.

Cheap Electricity in South Africa

Its possibilities in the development of the Union

IN his presidential address to the Physics Section of the South African Association for the Advancement of Science, Mr. Hugh Clark reviews the contribution that cheap electricity can make to the development of a country.

During the past fifty years, he points out, progress in steam stations (in which the consumption of coal per kWh generated has fallen from 21 lb. to less than 1 lb. in the best examples) has done much to discount the superiority of water power for this purpose, and to-day Klip station, in the Transvaal, generates at 0.081d. per kWh, compared with 0.091d. attained by the Ontario Hydro-Electric Commission. He expects a lowering of the cost of generation in South Africa—perhaps in time down to 0.05d. per kWh—owing to the great coal resources there, noting at the same time the tendency for fuel costs to rise in Great Britain and other countries. In 1937 about 36 per cent. (4.6 million tons) of the total coal mined in South Africa was used for generating electricity at 5s. per short ton (2,000 lb.) at the pithead, compared with as much as 14s. 4d. in Britain.

While the population of the Union is too small to provide adequate markets and transport charges to other parts of the world are heavy, Mr. Clark considers that many commodities could be produced by cheap electricity at a price that would enable them to be sold in Britain. He instances calcium carbide, which requires about 3,500 kWh per ton of carbide. British requirements are 60,000 tons per annum, 60 per cent. of which (valued at £625,000) comes from Norway. In wartime the treating of carbide for the ultimate preparation of nitrates is an important possibility.

With the resources of chromium, manganese and iron in South Africa, there should be a big market for ferro-alloys for the United Kingdom, where the domestic consumption is now largely met by imports from European countries in which cheap electric power for their reduction is available. The production of aluminium, which needs about 20,000 kWh per short ton, offers another promising field with bauxite supplied from India. The author envisages factories near a port such as Durban, supplied from generating stations using low-grade fuel on the Natal coal fields. Capital charges and losses on a 50,000-kVA line would represent about 0.025d. per kWh at 100 per cent. load factor.

Nitrogen fixation presents another possibility and requires about 60,000 kWh per ton by the arc process. The latter is, however, now little used, but a synthetic ammonia process is working at Modderfontein for the supply of ammonia and nitrates for the explosives industry.

While the development of water power in South Africa is not likely to prove remunerative on its own account, the author suggests that small hydro-electric schemes might be formed as a by-product of land drainage. The need is urged for legislation to prevent the excessive contributions made by some municipal undertakings to the relief of local rates. In one city undertaking the proportion of the gross surplus allocated to this purpose was 31.41 per cent.; this compares with an average of 2.45 per cent. in Great Britain. In addition, the entire cost of street lighting was defrayed out of the electricity revenue and, with high rents for poles, brought the total amount taken from the department to nearly 20 per cent. of the total receipts for energy sold.

An outline of a scheme for pumping sea water during light loads to a reservoir constructed on the Bluff above Durban, 300 ft. above sea level, is given. The capacity allowed for is 30,000 kW and over 100 million kWh per annum would be supplied during peaks at a cost of 0.2d., compared with the average cost per kWh supplied from the Congella power station in 1936-37 of 0.327d. It is stated that the cooling towers at Klip are capable of cooling 2 million gallons of water from 38 to 28 deg. C. with an atmospheric temperature of 21 deg. C. and a relative humidity of 75 per cent. A refrigerating plant of the same duty as one of these towers would have to abstract 360×10^6 B.th.u. per hour and would require about 50,000 kW to operate it.

Electricity in an Underwear Factory

Driving arrangements and special lighting

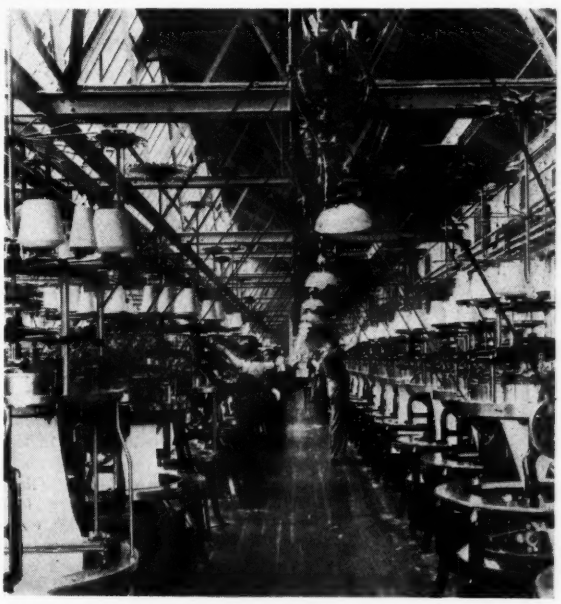
THE modern underwear factory of R. Richmond, Ltd., at Hucknall, covers an area of 1½ acres and is normally capable of producing 72,000 garments each week.

Cases of yarn are unloaded by means of a 10-cwt. electric hoist block and are placed in a store from which the runway extends into the knitting room, a total distance of 300 ft. Supply to the trolley wires is from a 400-V, three-phase 200-V d.c. motor generator and push-button control is provided to stop and start the set from four different stations.

On arrival in the knitting room the yarn is made into tubular fabrics of various diameters on circular knitting machines. Squirrel-cage motors of 4-8 h.p., underslung from the roof trusses, provide the motive power through short-centre vee-rope drives to line shafts, each shaft driving an average of ten machines.

From the knitting room the fabric passes to the cutting room, where it is pressed between steam-heated rollers in the calendering machines, driven by geared reduction motors with two push-button control stations on each machine. A motor-driven exhaust fan and trunking dispose of atmospheric steam. A three-phase mercury-arc rectifier supplies a battery of electric cloth-cutting machines, by which the various garment shapes are produced, and these are passed to the sewing room. Here motors of ¼ to 4 h.p., push-button direct on and manual s.d. controlled, drive the various benches of machines, and in some cases individual machines. The garments are then steam pressed or electrically ironed. The presses are connected to a motor-driven, direct-coupled vacuum set for drying, and the 700-W irons are fitted with three-heat switches. The garments pass on to be examined, boxed and finally packed in the despatch room, whence they are carried by a three-phase electric hoist block to the loading dock. This runway also extends to the packing case store, and saves much manual labour in handling large numbers of cases daily.

Electric clocks are installed in all departments and offices, and an electric staff locator provides immediate contact with departmental chiefs throughout the works. A transmitter in the general office sends out, by means of a rotary switch, any one of fifteen colour combinations, to groups of four coloured lamps situated in the works and offices. Attention is drawn to these by means of hooters, which give either of two signals. Internal telephones give communication between departments. Exhaust fans with 36 in. diameter blades electrically driven provide seven changes of air per hour, and the push-button starters are grouped to provide control from one position. A neon sign 225-ft. long occupies a prominent position facing the main railway line, and is carried out in red, green and gold tubing, controlled by time switch. A spacious mess room



Bay of automatic knitting machines

is provided, and the local rediffusion service is connected for radio entertainment. Lighting is by fourteen 100-W lamps in white opal cube fittings.

The knitting machine lighting, which accounts for 7.2 kW, consists of white opal reflectors, a certain amount of top light

Calculating Pole Rakes

By D. J. Hartshorne

A novel method of procedure

THE choice and correct raking of the right type of pole for the support of a trolley-bus overhead system is a major factor in the construction of the latter. Under-raking only becomes apparent when the full strain of the overhead equipment is taken by the poles and re-raking under such conditions is a costly business, far in excess of the original cost of erection.

Over-raked poles are an eyesore and undoubtedly detract from the appearance of the overhead equipment no matter how well it is erected. By careful consideration it is possible to determine before erection the type of pole, resultant strain, and the direction and amount of rake required for any individual pole.

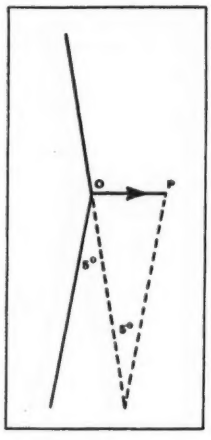


Fig. 1

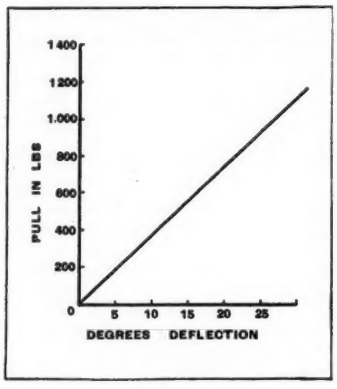


Fig. 2

A trolley wire is usually erected at a tension of 1,500 to 1,700 lb., and when any deflection of the wire occurs in the horizontal plane the pull transmitted to the pole is given by $P(\sin\theta/2)4$ for two-wire construction and $P(\sin\theta/2)8$ for four wires. The determination of this equation is the solving of a simple triangle of forces.

As an example, take the case of a trolley wire erected at a tension of 1,500 lb. and a deflection of 5 deg. and find the strain transmitted to the pole, neglecting weight of wire and fittings.

Fig. 1 shows the graphical solution, and the resultant OP, equal to 1,500 sin $\theta/2$, is the required strain.

By inserting numerical values for P and θ in the equation and plotting the result against the angle of deflection a graph can be formulated as in fig. 2.

In the planning of junctions and curves the overhead-wire layout is usually superimposed on a survey plan of fairly large scale and the trolley-wire deflections can be obtained therefrom by means of a protractor. Referring these deflections to the graph the total strains can be ascertained for any pole.

A pole has frequently to take the collective strains of bridle, span and pull-off wires; to obtain the resultant, a parallelogram of forces must be produced. This also gives the direction of rake. Three factors go towards the making up of the rake. They are deflection due to the elasticity of the pole, movement of the pole in the ground and positive rake to be left in pole when under load. British standard poles are manufactured for the following working loads with a 6 in. temporary deflection :— Light, up to 750 lb.; medium, up to 1,250 lb.; heavy, up to 2,000 lb. The final rake is therefore made up of the sum of the pole deflection, ground movement and the rake which is to be left in the pole.

The ground movements of poles under varying loads and in classified subsoils are given in the following table :—

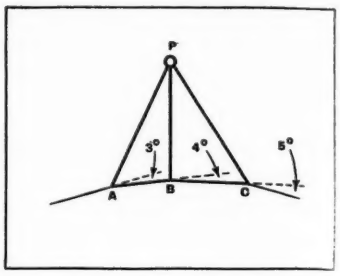


Fig. 3

Nature of subsoil.	Final load, lb.	Ground movement, inches.
Sandy or soft earth, made-up ground or soft clay	750 to 1,000	2 to 4
	1,000 to 2,000	4 to 6
Hard flinty strata, shale, sandstone or hard clay	750 to 1,000	1 to 3
	1,000 to 2,000	3 to 5
Rock or concrete	750 to 1,000	1 to 2
	1,000 to 2,000	2 to 3½

Assuming that four trolley wires are erected at a tension of 1,500 lb. and the deflections at the points A, B, C (fig. 3) are 3, 4, and 5 deg. respectively, what type of pole must be used and what are the direction and amount of rake required, if the subsoil is of hard clay?

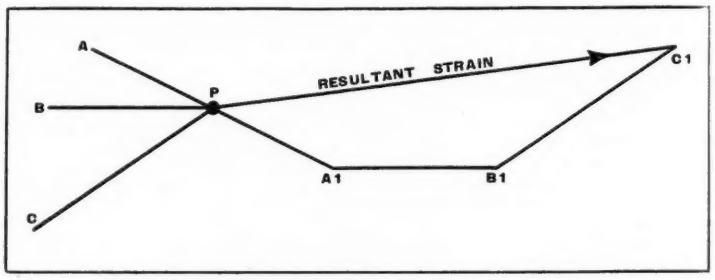


Fig. 4 (actual dimensions)

Using a scale of 400 lb. to 1 in., A=320 lb. is 0.8 in., B=400 lb. is 1 in., and C=520 lb. is 1.3 in.

Produce A P in fig. 4 by 0.8 in. to A_1. Draw A_1 B_1 parallel with BP and 1 in. long. Draw B_1 C_1 parallel with CP and 1.3 in. long. The resultant C_1P is 2.8 in. long=1,120 lb. Using B.S. poles a medium pole is required. If the positive rake to be left in the pole is 3 in. and the ground movement for the above load is 4 in., then the rake required is 6 in.+3 in.+4 in.=13 in.

Electricity in an Underwear Factory (*Continued from preceding page*)

being necessary to enable the machines to be threaded up, while a low mounting height prevents glare when this operation is being carried out. Glass reflectors of prismatic design fitted with 200-W lamps provide 8-ft. candles intensity in the cutting room, and a similar installation in the sewing room with 300-W lamps provides an intensity of 15 to 20-ft. candles. Despatch room lighting is by 400-W and 250-W mercury electric-discharge units. The office lighting consists mainly of circular prismatic units, mounted close to the ceiling, and corridors and staircases are effectively lighted by prismatic bulkhead fittings.

An interesting feature of the building construction is the provision of trenches beneath the floor, with trap doors to provide access. Then enables a maximum amount of conduit to be carried out of sight, a point especially helpful in the sewing room where otherwise a number of unsightly vertical conduit drops to the motors would have been found unavoidable.

Screwed conduit has been used throughout, with a minimum cable size of 3/0.036 for lighting circuits in the works where long runs are unavoidable. Supply is taken from the Nottingham Corporation at 400 V, three-phase, 50 cycles to the main control panel, which carries iron-clad air-break triple-pole switches for lighting and single-phase power control, the three-phase power supply being controlled by a triple-pole oil-immersed 200/300-A circuit breaker fitted with earth-leakage relay.

A 7-kW Diesel-driven generator is installed for emergency lighting in the event of a mains failure, although such a situation has not arisen since the supply was connected in August, 1935. There are 312 lighting points with a connected load of 42 kW, sixty-four motors totalling 108 h.p., irons 3 kW, and neon sign 4.8 kVA. Nine miles of Henley cable ranging in size from 3/0.029 to 37/0.083 were used in wiring the installation, which was carried out by the proprietors' own staff under the direction of Mr. Fletcher, the electrical engineer.

Reorganisation of Distribution

By H. M. Sayers

Heads for agreement between municipalities and companies

The delay in the presentation of the promised, or threatened, Distribution Bill has given the electricity supply industry a breathing space. Will it avail itself of this opportunity to come to some measure of agreement to enable it to present a more or less "united front"?

THE Report of the McGowan Committee is, first, a statement of facts deduced from the evidence laid before it relating to the existing organisation of distribution and its results and, secondly, a set of recommendations for the reorganisation of distribution designed to remedy some of the shortcomings of the present organisation.

The Committee found that the costs of distribution vary very widely and that there is a pronounced inverse relation between the average cost of distribution per kWh sold and the annual sales of undertakings, the range being from 2.4814d. in undertakings selling under one million kWh down to 0.5881d. in undertakings selling 50 million and over. These are average costs for undertakings in each class. Power companies and J.E.A.s are excluded from the table, as bulk supply costs are not comparable with detail distribution costs.

The same table (No. II in appendix II) of the Report shows that both the capital cost per consumer and the kWh sold per consumer per annum rise with the magnitude of the undertakings (as measured in kWh sold per annum) but the latter rise faster than the former so that the kWh sold per £ of distribution capital increases with that magnitude. The range is from 13.5 kWh per £ in the 208 undertakings selling one million and under, to 49.72 kWh per £ in the eighteen undertakings selling 50 million and over. The figures for each of the six classes are averages, and doubtless figures for individual undertakings in each class scatter widely from the average, but, for example, if the one million class has some members with much lower costs than 2.4814d. it must have some with much higher costs, and 208 is not an insignificant proportion of undertakings out of the 597 classified. The Committee drew the irresistible conclusion that many undertakings are too small for economical costs of distribution and cannot offer such low prices as undertakings of economic size.

Uneconomic Areas

It found that local authority boundaries do not generally define economic areas for the supply of electrical energy, and that as areas of supply are now based upon local authority areas that basis should be abandoned in favour of one more nearly related to economic considerations. Other facts, such as the variety of systems and voltages, the variety of tariffs and prices, the wide ranges of utilisation, and of actual to potential consumers are all found to be related to an excessive number of distributors, to the varying conditions of their areas and to variations in the commercial policies of the undertakers. It also found that some undertakings have not provided mains in considerable parts of built-up urban districts, and that large areas (mostly rural) are electrically undeveloped. Some of these are outside areas of supply; some are in such areas but the undertakers consider them to be not worth development.

The proposals of the Committee to remedy these conditions, and of the Commissioners' very similar proposals as set out in the White Paper, have been energetically criticised and their proposed enforcement by legislation has been energetically opposed by some representatives of the supply industry. It is not unfair to say that the opposition has been most pronounced by representatives of municipal undertakings—notably by those of the "smaller" undertakings. As for a number of reasons the Government Bill (which would presumably have followed the lines of the White Paper in its main provisions) has been postponed, there is still an opportunity for the supply industry as a whole (in the measure to which it can achieve collective pronouncement) to offer substitutes for such of the Commissioners' proposals as it considers objectionable or capable of improvement. This might be done by a discussion of the proposals by a representative body of undertakings of all classes. Their conclusions should show some measure of agreement upon principles and bring out points of disagreement and show how the latter are related to the conditions of different undertakers, or are general.

Recommendations and Questions

The following is a short agenda for such a discussion taking as texts certain McGowan and White Paper proposals. It does not cover the territorial districts and groupings of the White Paper. Those details seem proper subjects for discussion with and inquiry by the Commissioners when they proceed to give effect to the legislation embodying the principles to be followed:—

1. **Fewer Undertakings.**—The McGowan Committee proposed a substantial reduction in the present number of undertakings by the substitution of larger and more economic units. (Note: The White Paper accepts this.)

Question: Agreed or not agreed? If not agreed, what are the reasons against the proposal?

2. **Purchase Rights.**—The Committee proposed the prevention of the splitting up of comprehensive undertakings by the exercise of the rights of purchase by individual local authorities. (Note: The White Paper agrees, inferentially at least.)

Question: Agreed or not agreed; if not for what reasons?

3. **Absorption of Small Undertakings.**—The retention of the larger and more efficient undertakings, and absorption by them of the smaller and less efficient was recommended.

Question: This is consequential upon No. 1. The White Paper proposes three methods of effecting the same object of consolidating undertakings into large economic units. If the principle is agreed, it might be useful to discuss these three bases (A, B and C) in the White Paper. There might be some useful discussion of the criteria of "large" and "small," "more efficient" and "less efficient."

4. **Compulsory Powers.**—The McGowan Committee held that a voluntary basis of consolidation is bound to fail: legislation must confer definite and adequate compulsory powers.

Question: Can any voluntary basis be agreed upon? Can it be implemented without some measure of legislative compulsion? If not, what should be the main lines of such a measure of compulsion to "voluntary" action?

5. **Public Ownership.**—Schemes should make provision for the possibility of public ownership of all undertakings, including those not at present purchasable by local authorities. (Note: The McGowan Report suggests that public ownership by *ad hoc* regional authorities is not at present advisable; it suggests a maximum tenure of fifty years for the consolidated undertakings which should be purchasable by such public bodies at the expiry of the term.)

Question: "Yes" or "No" to the principle of public ownership. The White Paper agrees in principle with a more detailed method of the determination of the tenure of the consolidated undertakings; the public body may be one constituted for the purpose, or some existing body. This question has political implications. A P.E.P. Report (which professes political impartiality) favours immediate public ownership; the Labour Party has declared for complete nationalisation. Perhaps a committee of the industry would think it better to leave the Government and Parliament to decide the question.

6. **Regional Schemes.**—The Commissioners should be empowered to delimit the country into a number of areas, and to prepare schemes for each after consultation with the parties affected. (Note: The McGowan Report and the White Paper differ somewhat about the machinery for this application of the principle set out in proposal No. 1. The Committee envisaged each area as an "area of supply" of one consolidated undertaking; the White Paper proposes the delimitation of the country into thirty districts, with generally more than one consolidated undertaking in each, formed from seventy-six groups of existing undertakings. Both plans agree in taking into areas of supply the "undeveloped areas" and the application of some measure of compulsion to supply them; as well as to provide mains in all built-up urban areas. The Report suggests that local authorities might participate in guaranteeing return upon capital involved in the supply to villages.)

Question: This is another matter consequent upon the acceptance of proposal No. 1. The manner of delimiting and grouping seem suitable subjects for discussion in the application of legislation. A committee of the industry might find it possible to suggest some alternative way of ensuring supplies to rural districts. The McGowan Committee remarks that it seems essential to combine urban and rural areas in each consolidated undertaking.

7. **Confirmation of Schemes.**—The McGowan Committee proposed that schemes approved by the Commissioners shall become operative at once, unless objected to by undertakings selling more than ten million kWh in 1935-36. The White

Paper proposes that objections by any undertakers, without regard to size, shall result in the scheme being submitted to the Minister of Transport for approval, possibly with modification, and then to both Houses of Parliament. Thus even the smallest undertaker affected by a scheme would have a *locus* for recourse to the higher authorities, with consequent delay in the operation of the scheme.

Question: A committee of the industry might express a preference for one of these proposals, or for some modification of it.

8. Standardisation of Systems.—The Report lists thirteen "principal declared voltages" as well as a.c. and d.c. systems (77 undertakings have d.c. only; 283 have both; 282 have a.c. only). Standardisation is in progress. It is not practicable to enforce it immediately without financial aid from the Government or a levy upon the industry, both of which are rejected. Reorganisation into large undertakings should facilitate and expedite it. The schemes should provide for completion within a prescribed period.

Question: Can standardisation be accelerated by any combined voluntary action of the existing undertakings?

9. Standardisation of Charges.—The McGowan Report proposes that the consolidated undertaking in each area should be required to offer an approved statutory two-part tariff and an alternative flat-rate tariff for domestic supplies. It deprecates low flat rates as they militate against the acceptance of two-part tariffs and better utilisation of the supply. The White Paper agrees with the obligation to offer two-part tariffs; and proposes to enlarge the powers of the Minister regarding maximum prices, so that separate maxima, or separate methods of charge, may be fixed for different classes of supply. The Report insists that the basis of the fixed charge in two-part tariffs should be published. It recognises the necessity of the right to charge special rates for special uses.

Question: There may be agreement possible about the proposed enlargement of the Minister's powers to regulate prices and how they should be exercised—especially how applications for revisions should be initiated and dealt with. At present those powers are almost dormant. Undertakings have for some years had the right to get sanction for alternatives to flat-rate tariffs, but they have made scant use of the opportunity. The Report expresses a preference for the "size-of-house" basis for the fixed charge of two-part tariffs. As that question will only arise after a scheme becomes operative, it is not necessary to discuss it now. It may be suggested, however, that as the consolidated undertakings will generally cover both urban and rural areas, a "rateable value" basis will not be suitable. The White Paper proposes that company undertakings shall be subject to a sliding scale between prices and dividends (a schedule sets out the lines of such a scale) which may be specified in a scheme or in a Special Order. As it is proposed to schedule the skeleton scale to the Bill it is opportune to discuss it now.

10. Purchase Price.—There are some differences of detail between the proposals of the Committee and of the White Paper about the determination of the purchase prices of undertakings to be consolidated into larger units. The main consideration in both is that the purchase prices shall not load the capital charges of the consolidated undertakings so as to affect unfavourably the prices to be charged. The basis is the "then value" in both proposals.

Question: As the proposals are set out in detail in both documents any discussion should be prepared for by examination of both sets, and, if thought necessary, submitting articles for the agenda. The principal bone of contention will probably be that in the White Paper which specifically allows compensation for the cessation of dividends to the shareholders of companies, but no specific compensation for "loss of profits" to local authorities. Compensation to companies is not specifically mentioned in the McGowan proposals; it is probably intended to cover it by the equated tenure. Presumably, the difference is founded upon the fact that local authority undertakings are not owned by people who have adventured money on the prospect of getting a return to which they have a presumptive title for the duration of the franchise of the company, which will be cut short by the operation of earlier purchase. The suggested Committee might (or might not) be able to put forward something more satisfactory to both parties.

11. Rating Assessment.—The Committee considered it desirable that a more uniform method of assessment should be applied to all electricity undertakings.

Question: This is one item on which there should be no difference within the industry. Probably many undertakings would press for a less onerous basis, especially for some equalisation with manufacturers who get de-rating benefit—even for their private plants which compete with public supply.

Public Interest Paramount

The above subjects seem to be the principal points which could be usefully discussed by the suggested committee with a view to consideration by the powers that be. There are many others raised by both the documents considered. Everyone taking part in the discussions should read carefully both the McGowan Report and the White Paper. It would not be waste of time to read also the P.E.P. report on the subject as a considered view from the outside, studying the public interest as of the first concern. Of course, the McGowan Committee made the public interest its first concern, but it was necessarily trammelled by having to take into account the complexities of the present organisation, and to make proposals to re-shape rather than to revolutionise it.

Supposing that the suggested committee is unable to agree to the major proposals of the McGowan Report, I suggest that it might formulate methods of facilitating the extension of existing areas of supply and of co-operation between undertakings. At present the methods of extending areas of supply are cumbrous and dilatory; too much latitude for opposition is permitted. More liberty for the use of overhead lines with limitation of wayleave payments is desirable. Perhaps some district or regional organisation with supervisory, and to some extent mandatory, powers over existing undertakings within each district can be devised to carry out some of the chief objects of the McGowan Committee.

Possibly the Amendment of the Act of 1919 and its successors, making compulsory the formation of J.E.A.s in every district would suffice. But it seems to me that compulsory amalgamations, absorptions, and extensions of existing undertakings must be an essential feature of any worth-while reorganisation of distribution. We ought to get rid of the "parochial" swaddling bands of the 1882 and 1888 Acts; they are not fit for adult wear.

The Public Lighting Engineers' Conference

The fifteenth annual conference of the Association of Public Lighting Engineers is to be held at Bournemouth from September 5th to 8th under the presidency of Mr. C. H. Woodward. The proceedings will commence on the Monday afternoon with the annual general meeting, which will be followed by the official opening of an exhibition of public lighting equipment held in the Town Hall. A reception by the Mayor of Bournemouth will take place in the evening. On the Tuesday, after a civic welcome and the presidential address, a paper on "The M.O.T. Final Report" will be read by Mr. J. F. Colquhoun. A second paper, "Air Raid Precautions and Lighting," by Mr. Thos. Wilkie, will be read in the afternoon, while in the evening delegates will be entertained by the Bournemouth and Poole Electricity Supply Co., Ltd. "The Development of Street Lighting in a County Borough" will be the title of a paper by Mr. J. K. Brydges and Mr. N. Boydell, to be read on Wednesday morning. The annual banquet and dance will take place in the evening. A final paper, "The Radiation from Artificial Illuminants," by Mr. J. N. Aldington, will occupy the Thursday morning session, the afternoon being left free for motor coach excursions. The following will have stands at the exhibition:—

Automatic Telephone Co., Ltd.; British Foreign & Colonial Automatic Light Controlling Co., Ltd.; British Sangamo Co., Ltd.; British Thomson-Houston Co., Ltd.; Concrete Utilities, Ltd.; Electric Street Lighting Apparatus Co.; Engineering & Lighting Equipment Co., Ltd.; Foster & Pullen, Ltd.; General Electric Co., Ltd.; Gowshall, Ltd.; Holophane, Ltd.; Horstmann Gear Co., Ltd.; Keith Blackman & Co., Ltd.; C. H. Kempton & Co., Ltd.; Kurt Erlach, Ltd.; Measurement, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Philips Lamps, Ltd.; Radiovisor Parent, Ltd.; Revo Electric, Ltd.; Siemens Electric Lamps & Supplies, Ltd.; Simplex Electric Co., Ltd.; Simpson (Rye Harbour), Ltd.; Walter Slingsby & Co., Ltd.; Stanton Ironworks Co., Ltd.; Venner Time Switches, Ltd.

A New System of Pianoforte Electro-acoustics

At a recent meeting of the Institute of Wireless Technology a lecture was given by the president, Mr. S. A. Hurren, who, after referring to the acoustic development of the pianoforte, explained that the recording and broadcasting of the pianoforte by the usual methods, using a microphone or several microphones, had disadvantages which were difficult to overcome. Oscillograms were distributed showing comparative wave-forms of string and soundboard, photographed simultaneously. The inventor of the "Pianotron" had, he said, overcome previous obstacles by utilising an entirely different technique, and it was now possible to amplify every note of the pianoforte and actually improve upon the normal tone, making the output from a small upright instrument superior to that of a concert grand. In this system, each note had its own pick-up, by which effective and permanent "voicing" could be secured for the whole range. At the end of the lecture a recital of pianoforte music, both "straight" and amplified, was given which indicated the ease of manipulation of the instrument by any capable musician.

The examination syllabus and membership regulations of the Institute have just been revised, and are obtainable from the Secretary, 4, Vernon Place, Southampton Row, W.C.1. A new class of membership—the graduate—has been created.

Water Power in Germany

By T. C. Gilbert, A.M.I.E.E.

Recent developments in the Ruhr district

[*Elliott & Fry*

Mr. T. C. Gilbert

RAPID development in water-power utilisation has taken place during the past ten years in Germany. An official survey, made in 1930, shows that Bavaria is the State richest in water power, which when fully developed is expected to give an output of 3,700,000 h.p. About 80 per cent. will be developed from the Danube and the remainder from the Main; over 30 per cent. has already been developed.

The second State is Prussia with 2,200,000 h.p., about 35 per cent. being developed to date, chiefly in the Westphalian province. The Ruhr river, with its tributary the Lenne, has been the scene of the greatest activity. This river flows into the Rhine some thirty miles above Cologne, about the northern boundary of the Rhineland province, which absorbs 50 per cent. of the increase of 115,000 h.p. recorded for the five years up to 1930. Prussia was estimated to have an output of over 750,000 h.p. in that year, of which the Westphalian province, covering the Ruhr district, was responsible for 175,000 h.p. There was, in addition, the Herdecke storage plant on the Ruhr, the peak load on this station being about 200,000 h.p. In the Ruhr district coal is always available, and the main problem to be faced by suppliers is not seasonal variations of load but the meeting of peak loads at much shorter intervals.

Great activity has been taking place in Germany during the past ten years in the utilisation of water power. This is especially the case in the Ruhr district, where the main problem facing the suppliers of electricity is not seasonal variations of load but the incidence of peak loads at much shorter intervals

Three principal corporations govern the water-power plants in the Ruhr district: the Rhenish-Westphalian Power Co. (the R. W. E.); the Ruhr Association, incorporating several smaller bodies and founded in 1913 for preserving the Ruhr from pollution; and the United Electricity Company of Westphalia (V. E. W.), formed in 1925 by the voluntary amalgamation of several concerns.

It has been stated that the R. W. E. is the largest electricity supply concern in Europe. It operates, in addition to its steam stations, thirty-two small and medium-sized water-power stations on the Neckar, Wupper and Ruhr rivers and in the Moselle territory, and has large hydro-electric stations in Baden, in Vorarlberg (Austria) and Switzerland. The total output of these plants, most of which lie outside the Ruhr district, is over 600,000 h.p. The stations are interconnected by long-distance lines, operating at 380/220 kV, and the most important control point is at Brauweiler, which is said to be the largest open-air station in the world.

Storage and Peak Loads

In the R. W. E. area interest centres in the power storage and peak-load station at Herdecke, on the banks of Hengstey Lake. The capacity of the reservoir is 35 million cu. ft. The total length of the pipe line is 820 ft. and the gradient 57 per cent. The oval upper reservoir covering 18½ acres has been constructed to permit the full development of the available power, a storage of about 350 million gals. being provided with a maximum variation in water level from empty to full of 65 ft. The maximum pressure head between the lower reservoir and a full upper reservoir is 540 ft.

Three of four pumps each of 525 cusecs capacity can fill the upper reservoir in 10 hours. The power required, approximately 105,000 h.p., is obtained at night from the steam stations, so that 560,000 kWh is available for use at any time during the day. This enables the R. W. E. to satisfy special peak-load demands without any increase in tariff, which for domestic purposes is about 1d. per kWh. The four turbines have a capacity of 910 cusecs with an aggregate h.p. of 194,000. The upper reservoir can be fully discharged in 4¼ hours.

The power house is 500 ft. in length. Each machine set is 85 ft. long and consists of a 300-r.p.m. spiral Francis turbine with free shaft end, a synchronous three-phase machine operating either as generator or motor, and a twin two-stage pump. The station can be automatically switched from pumping to turbine operation in two minutes, and during pumping the turbine discharges are closed by flaps. Each unit has a main pressure pipe line, the lower branch of which, leading to the pump and turbine, can be closed by a 5 ft. 9 in. diameter emergency valve. The pipes are in pairs in a common channel, with an inclined elevator for access to the hill-top. The valve house is situated at the upper anchorage point of the pressure pipe line, and the hand-operated and automatic throttle valves, as well as the elevator machinery, are controlled from here. The internal diameter of the inclined pipe lines, four in number, is 8 ft. 4 in., corresponding to a maximum water velocity of 16½ ft. per sec. From the valve house each pair of inclined pipes is joined to form a single 16 ft. 5 in. diameter pipe, and the two upper pipes lead back on a gradient of 1 to 13½ to the upper reservoir. They emerge into a trumpet-shaped cutting in the floor of the latter at a point about 31 ft. below the upper reservoir's floor level. The pipe lines in this scheme were designed in general upon static calculations, and an allowance of 50 per cent. for surges or sudden vacua was made.

The construction of the upper reservoir, 791 ft. above sea level, necessitated the excavation of 1,300,000 cu. yds. of rock. On the east side, where the pipe lines are located, the reservoir is bounded by a sloping concrete-lined rock face, whereas the other longitudinal side is formed by gravity walls, which have a maximum height of 70 ft. running back to meet the rock slope. The entire concrete surfaces coming in contact with water were rendered impermeable by a double bitumen spray treatment. In the construction of this plant more than 435,000 cu. yd. of concrete were placed, and approximately 1.7 million cu. yd. of earth and rock were excavated. The work commenced at the beginning of September, 1927, and the station was brought into operation in December, 1929.

In the erection of river works the V. E. W. aims chiefly at utilising the available energy during the daytime by the provision of storage ponds which fill during the night. A characteristic example of this is furnished by the Steinhelle station. Of the various storage reservoirs controlled by this company, the largest is the dam in the Moehne river, a tributary of the Ruhr. Other V. E. W. dams are the Henne and the Sorpe.

Although the hydro-electric energy available in the territory of the V. E. W. is relatively small compared with the coal energy (about 600 million kWh per annum is obtained from an installed steam capacity of 325,000 h.p.) the company operates over twenty hydro-electric stations with a developed output of more than 25,000 h.p. and a mean annual production of 45 million kWh. To this must be added a further 5 million kWh taken in bulk from other water-power plants.

The Steinhelle station is situated at the confluence of the Neger and the Ruhr rivers. Higher up the Ruhr is the Wiemeringhausen plant. The head available for use at Steinhelle is about 250 ft., this being the difference in level between the two stations, and the Wiemeringhausen plant operates with a head of 275 ft. Both stations are provided with night-storage ponds. The waters of the Neger are conducted through a reinforced concrete aqueduct of 4 ft. 3 in. internal diameter and a 2,300-ft. tunnel to the Ruhr valley, where a junction chamber also takes up the waters of the Ruhr which are brought to this point by a 5 ft. internal diameter reinforced-concrete pipe. Here the water level is regulated either automatically or by remote control from the power station. From the junction chamber the water passes along a 6 ft. 6 in. diameter reinforced-concrete pipe and through a steel inverted syphon to the surge chamber.

Six-mile Head Race

The total length of the head race is about six miles, and the adjoining pressure pipe line, 1,100 ft. long and 4 ft. 7 in. internal diameter, leads to the power house. The plant comprises two similar Francis turbines with horizontal shafts, having a total output of 3,200 h.p.

A compensating pond below Steinhelle has a useful capacity of 15½ million gals., and a natural-flow station in the small dam at Olsberg is equipped with a 320-h.p. Kaplan turbine operating with a head of from 17 to 23 ft. This station, which regulates the water supply downstream, is utilised irregularly in the peak load operation of the Steinhelle plant.

The Moehne Dam, with a capacity of 34,000 million gals. and a catchment of 160 sq. miles, has an average annual out-

flow of 54,000 million gals. It is constructed as a gravity wall 132 ft. high above the foundations with a base thickness of 112 ft. The width of the crest is 20 ft. and its length 2,130 ft. In order to meet peak loads the principal power station at the foot of this dam was designed to use the available quantity of water in four hours.

Below the main station a compensating pond of 88 million gals. capacity leads off the daily discharge from the dam by a subsidiary power station with a head fluctuating from 6 to 18 ft. The amount of water discharged during the day is determined by the downstream demand, but is not released uniformly throughout the twenty four hours as it is utilised during the few hours of maximum demand on the network of the V. E. W. The flow of the released water into the Ruhr is, however, kept reasonably uniform by the compensating pond.

The power house at Moehne Dam contains four sets, each consisting of two Francis turbines and a 1,500-kW, 375-r.p.m. three-phase generator. Two additional turbines, one of 2,200 h.p. and an auxiliary of 1,000 h.p., were installed because the effective head may vary from 110 ft. to 53 ft. owing to the lowering of the storage level of the Moehne lake. The main power plant has an output of 6,000 kW and the auxiliary unit of 500 kW. The turbines can be brought into service almost instantaneously.

The Henne dam in another side valley of the Ruhr has a storage capacity of 2,500 million gals. and a mean annual outflow of nearly 9,000 million gals. Below the 125-ft. dam the water is conveyed to Meschede power station. The Sorpe dam, 197 ft. high, has a capacity of 18,000 million gals., the largest in the Ruhr district, and at its foot, as at Moehne, there are a main power station and a compensating pond with a subsidiary power plant. A output of 9,000 h.p. is available, which it is proposed to develop fully by the installation of a pump-storage plant.

The Hengsty Lake contains about 660 million gals. and is 2½ miles in length. The end of the lake is formed by a weir about 1,000 ft. long, fitted with four roller gates, each 20 ft. high by 100 ft. long. With the rollers in their lowest position a discharge of 9,200 cusecs is obtainable. As the crest of the weir is well above high-water level, the plant can easily lead off the maximum floods of the Ruhr. The adjustable rollers pass drifting ice and floating matter, and regulate the dammed level in order to avoid washing away the settled iron sludge.

The intake spirals of the turbines of the Hengsty lake power station of the Ruhr Association are equipped with a fine grating, and the inlet of each turbine can be closed by large gates moving on rollers; each gate is 12 ft. in height by 25 ft. in width. The turbines of this station have a capacity of 1,000 cusecs, a net head of 15 ft. at mean water level, and an output of 1,400 h.p. each at 125 r.p.m. The power house, built at one end of the weir, is of reinforced concrete 117 ft. in length, 68 ft. wide and 91 ft. high, including foundations. This height was necessary to allow the largest machine parts to be lifted over one generator by the overhead travelling crane while the station is working. The switch house is a three-storied structure, and the operator's stand is located in the first storey on the tail race side, whence he commands a good view over the entire plant.

A consideration of the outflow to be maintained from the lake and of the working conditions of the river clarification plant at Hengsty led to the installation of three 10,000-kW propeller turbines. Two are of the Kaplan type with rotary blades in order to obtain a high efficiency at low admission. By this means extra power to the extent of about 1½ million kWh can be exploited annually. The runner has a diameter of 8 ft. 10 in. and is provided with four blades, the guide wheel having twenty blades. An ordinary propeller turbine installed between the Kaplan turbines carries the base load.

In the design of river power stations along the Ruhr, account has had to be taken of considerable fluctuations in the discharge of the river. Large volumes with small heads and small volumes with large heads are encountered. The lowest low-water level has a ratio of 1 : 200 to the maximum high-water level, and the relatively small area affected by barrages in the catchment area of the Ruhr is of little influence in meeting this problem. For these unfavourable working conditions Kaplan turbines with movable blades have proved specially suitable.

With ordinary propeller turbines the efficiency decreases with reduced admission to an extent that rises with an increased speed of the turbine. The Kaplan turbine, however, combines economically favourable high-speed operation with high efficiency, even at partial admission. High-speed operation reduces both the cost of the machines and of the buildings considerably, and generally the employment of gearing can be avoided with propeller turbines.

Quebec Leads Electrically. By H. E. M. Kensit, M.E.I.C.

Approximately 3,770 kWh consumed per head last year

IT is believed that the province of Quebec, in Canada, has for several years had to its credit a higher degree of electricity utilisation than has been achieved in any country. A comparison with Norway, which for many years held the record, was given in the ELECTRICAL REVIEW of January 8th, 1937, based on 1935 figures, and showed a large lead by Quebec, which was increased in 1936. The results obtained by Quebec in 1936 and 1937 show such further progress that they are well worth setting forth in greater detail.

Quebec may be justly termed a "country" for purposes of comparison, for it is a self-contained industrial unit of Canada and is the only province with a two-chamber government. It has a total area of nearly 600,000 square miles, but a liberal estimate of the populated portion gives some 162,000 square miles, or about twice the area of Great Britain. Its water power is so abundant that some 15 per cent. of its total production of electricity is exported, and it utilises a further amount of nearly 50 per cent. within its own borders for the supply of electric steam boilers at nominal prices. While the province contains many great and varied industries, it is these two factors of export and electric boilers that mainly account for the exceptional production and consumption recorded for Quebec.

This unusual "boiler load" may be briefly explained for those not familiar with it. Quebec water power is not only abundant but "favourable," and it costs proportionately little more to develop a site fully than partially. This has led to the development of more power than is required for general purposes and the surplus has been sold to raise steam for electric boilers. Some of these are very large and the load amounts to approximately 1,000,000 kW. Energy for this purpose, mainly for pulp and paper manufacture, is sold at nominal prices and usually on the condition that it may be withdrawn when a more remunerative market develops. It is these transactions that largely account for the very low average price for "large power" set out in the table.

The statistics of world electricity production issued by the League of Nations and the World Power Conference include Canada but naturally do not show separate provinces. Parts of Canada are mainly agricultural—other parts are quite intensively industrial; the result is that the electricity production for the Dominion as a whole in 1937 was about 2,480 kWh per head, but for the province of Quebec it was 4,560 kWh, or nearly double. Furthermore, the figures given in some cases include both public utilities and private industrial plants, the latter sometimes representing more than half of the total. The figures given for the province of Quebec cover public utilities only; public utility supply is exceptionally developed and the production by private industrial plants constitutes less than 2½ per cent. of the total. The public, or central station, supply in the province is furnished almost entirely by companies, which generate over 99 per cent. of the total output, so that the high degree of utilisation is the attainment of private enterprise.

ANALYSIS OF ELECTRICITY SALES, WITH PRICES

	kWh sold. (millions).	Price per kWh.	
		Cents.	Pence.
Domestic service	241.8	3.19	1.595
Commercial light	213.7	2.95	1.475
Small power	93 4	2.46	1.230
Large power	9,702.4	0.29	0.145
Street lighting	38.1	3.15	1.575
	10,289.5	0.45	0.225

The 13,019.9 million kWh generated in the province in 1936 was 51.3 per cent. of the total for the whole of Canada. Of this 1,881.8 million kWh was exported (net), making the consumption within the province 11,138.1 million kWh. Losses accounted for 833.1 million kWh (6.4 per cent. of kWh generated) and free service for a further 15.5 million kWh, the remaining 10,289.5 million kWh was sold as shown in the accompanying table. The figure of 0.45 cent is the price received per kWh distributed to consumers, and the corresponding figure for the revenue per kWh generated is 0.35c.

The population of the province in 1936 was 3,096,000 and the kWh generated and consumed per head 4,210 and 3,600, respectively. Complete figures for last year are not yet available, but the corresponding figures are roughly 3,135,000 population, and 4,560 kWh generated and 3,770 kWh consumed per head.

Elasticity in Domestic Loads

By G. O. McLean, M.Eng., A.M.I.E.E.

Lowering the running charge of two-part tariffs

The author discusses what can be done in the way of modifying the fixed charges and lowering the kWh component of two-part tariffs.

THE end of the municipal financial year invariably means stocktaking, and a wise manager does not limit himself to a counting of the material goods in his stores, or even to decisions as to which lines should be discontinued. He applies to his technical and financial results the same processes, namely, "counting" or analytical scrutiny and "scrapping" or modifications to plant, systems and tariffs.

In his opportune paper in the February I.E.E. *Journal* (Vol. 82, No. 494) entitled "Electricity Demand and Price," Mr. D. J. Bolton draws the following conclusions: that the lighting load is inelastic, and small price reductions about the 3d. mark are useless; that the non-lighting domestic load has an elasticity of 1½ to 3, and consequently small price reductions should create increased sales and that it is the incremental cost or "follow-on" rate which really matters—or as he puts it, "mean prices will be governed by marginal utility." The two-part tariff is therefore the supply industry's greatest aid to increased sales.

A good tariff, according to the 1930 Committee on Tariffs, should be simple in character, readily applicable, equitable to both consumer and supply authority, involve the smallest possible expenditure for meters or wiring, and most important of all, have a secondary or kWh charge as low as practicable. On these recommendations Mr. J. A. Sumner (I.E.E. *Journal*, Vol. 81, No. 490) has built up a strong case for a "consumer charge," to which insufficient attention has been given by the supply industry. The 0.5d. kWh charge advocated and used by Mr. Sumner as a standard is becoming the country's standard.

Fixed Charges Too Low

We have a vicious circle in that secondary charges cannot be reduced because fixed charges are too low, since they have been derived from the lighting load costs as given by the lighting flat rate, and the latter has been brought too low either through ignorance of the inelasticity of the lighting rate between 7d. and 2¾d. or for political or other reasons.

What, then, can be done to break the circle by modifying fixed charges and lowering kWh or incremental charges for domestic consumers? In the first place more than 80 per cent. of the cost of giving a supply can be considered as fixed costs. Then, on grounds of equity, should not the same proportion as this appear in consumers' accounts?

In the second place, whereas for convenience (though not with strict accuracy) the supply fixed costs are expressed in £ per kVA, it is not practicable to measure the demand of each consumer and charge him his proportion of the supply costs, nor would it be equitable owing to the diversity of incidence of the individual demands.

The problem of finding a "yardstick," having some relation to demand, on which to base the consumer's fixed charge has generally been solved by using the size or rateable value of the house. The floor area basis is the one officially recommended by the Committee on Tariffs, and since rating assessments (consequently the percentage of rateable value levied as fixed charge) vary from town to town, being generally lower in the North than the South, the floor area basis is used in the calculations which follow.

Four classes of consumers having different sized houses are considered: A, a small cottage or modern artisan's dwelling of 600 sq. ft. floor area; B, the average John Citizen's house of 1,200 sq. ft., in which there are no servants; C, the detached villa in Suburbia of 2,400 sq. ft., which houses one servant besides the family; and D, the large house of, say, 6,000 sq. ft., where all the domestic work is done by three or four servants. Supply costs are taken in round figures, such as £10 per kVA, plus 0.25d. per kWh. Such figures may be 50 per cent. high for large undertakings owning a selected station and with domestic electrification reasonably developed, while on the other hand the figures may be low for small undertakings buying at grid tariff, and having only domestic consumers with a consumption of 200 to 300 kWh per annum per consumer. However, if the kWh charge of 0.25d. is 20 per cent. of the total, the £10 per kVA presupposes a load factor of 27 per cent., and that is near enough to the present poorly developed state of domestic electrification to be good enough for our hypothesis.

The Lighting Load

Considering first the inelastic lighting load, and assuming that the load factor for each of the four classes of houses is 15 per cent., *i.e.*, the individual demand coinciding with the system peak is presumed to last on an average 3.6 hours in each 24, then table 1 can be filled in to ascertain the annual consumption for lighting. Assumptions made with regard to installed load and demand are purely empirical, based on experience, and have no relation to recommended or actual illumination values. Some diversity among the class itself is allowed for. Similarly, the empiricism has justified approximations, the slide rule being used in all the calculations

TABLE 1.

Class.	Watts installed.	Average demand on peak.	kWh per ann. at 15 per cent. load factor.
A	300	100 W.	131
B	750	250 ,,	328
C	1,200	600 ,,	788
D	4,000	2,000 ,,	2,628

With supply costs of £10 per kVA, plus 0.25d. per kWh and a load factor of 15 per cent., the cost to supply each kWh for lighting will be approximately 2.07d. and the cost to supply the requirements of each of the four consumers will be as shown in line 2 of table 2, and as plotted in fig. 1. To convert these costs into a two-part tariff, a uniform "consumer's charge" of £1, £2 and £3 as suggested by Mr. Sumner is applied; and to equate revenue to actual costs, variable "secondary" or "incremental" charges have been applied.

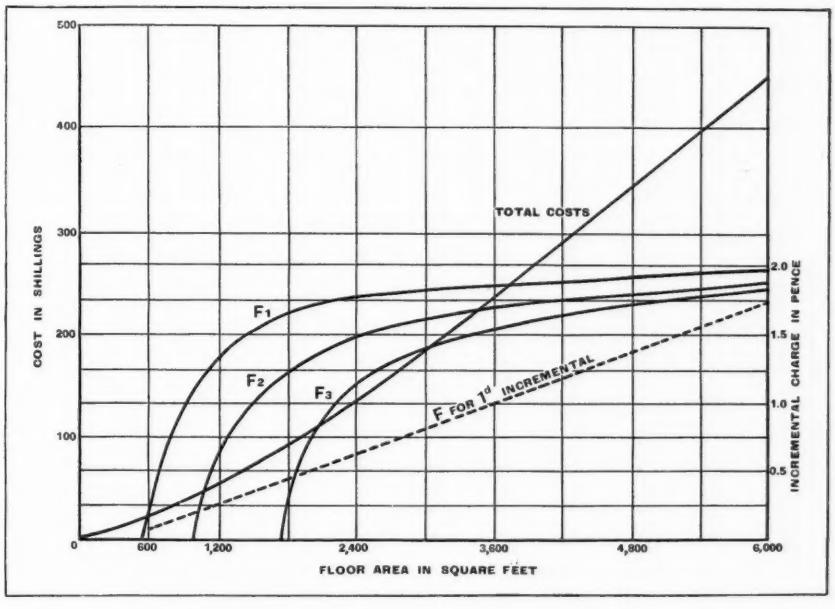


Fig. 1.—Lighting costs

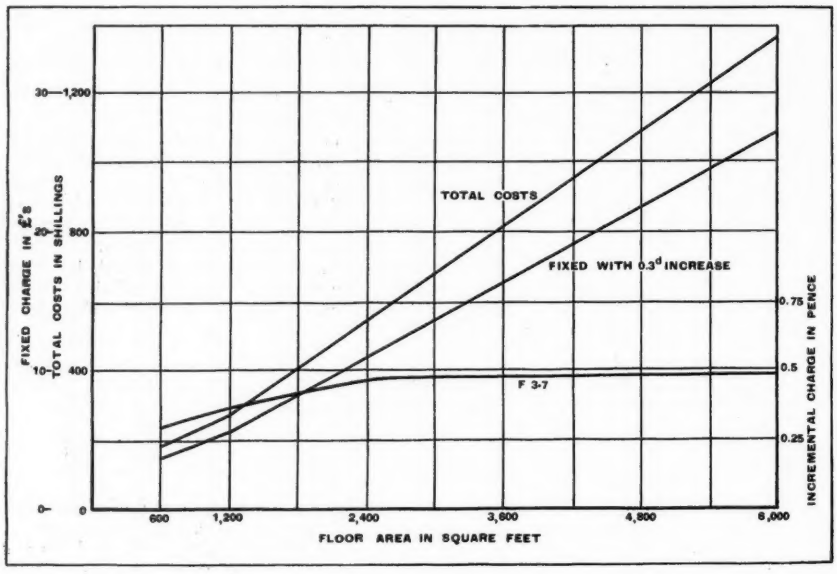
We desire, however, to make the incremental charge uniform and hence must depart from the uniform consumer's charge and vary the fixed charge portion in relation to the floor area. Thus if we desire a 1d. incremental charge for lighting, the fixed charge should vary from approximately 10s. for A to £11 8s. for D. For illustration, these two limiting figures have been joined by a straight line in fig. 1, though the line

should actually be a curved one similar in shape to the total costs line. Table 3 results are obtained in a similar way for the average lighting plus heating load, obtained where a 1d. power rate is in use.

TABLE 2.

Consumer	A	B	C	D
Lighting, kWh	131	328	788	2,628
Supply cost at 2.07d. per kWh ...	22.6s.	56.5s.	136s.	456s.
Incremental charge per kWh if fixed charge is £1, i.e. :				
F1	0.21d.	1.37d.	1.77d.	1.98d.
F2	0	0.61d.	1.46d.	1.88d.
F3	0	0	1.15d.	1.79d.
F11.8	0	0	0	1.0d.

The load factor of 20 per cent. may arouse some comment,



but my experience is that the occasional radiator is no better from the supply undertaking's point of view than ordinary lighting. However, the cheap power rate has been considerably used for development of other apparatus, such as refrigerators, kettles and vacuum cleaners, and so in table 3 an incremental charge of 0.75d. has been postulated, giving a variation of fixed charge of £(3+) for A to £47.7 for D.

TABLE 3.—LIGHTING AND OCCASIONAL HEATING AND SMALL POWER.

Consumer	A	B	C	D
Installed load in kW	2	6	12	25
Demand-diversity allowed for ...	0.5	1.5	3	7.5
kWh at 20 per cent. load factor ...	876	2,628	5,256	13,140
Supply cost at 1.62d. per kWh ...	118s.	355s.	710s.	1,775s.
F1	1.34d.	1.53d.	1.57d.	1.6d.
F3	0.79d.	1.35d.	1.48d.	1.57d.
F47.7	0	0	0	0.75d.

TABLE 4.—ALL-ELECTRIC.

Consumer	A	B	C	D
Installed load in kW	12	18	25	45
Demand diversity increased ...	1.0	1.5	3	7.5
kWh at 50 per cent. load factor ...	4,380	6,570	13,140	32,850
Supply cost at 0.79d. per kWh ...	288s.	433s.	865s.	2,160s.
F3	0.625d.	0.68d.	0.735d.	0.767d.
F9	0.30d.	0.46d.	0.625d.	0.72d.
F66.8	0	0	0	0.30d.

Further tables could be added for additional loads, such as cooking and water heating, till finally we come to the goal of the house that is all-electric to the extent of lighting, cooking, water heating, washing and bedroom fires. Table 4 indicates the assumptions made and the results obtained with the same hypothetical costs. It will be seen that if we aim at the low incremental charge of 0.3d. per kWh, the fixed charges vary from £9 for A to £66.8 for D.

The 0.3d. incremental charge has been deliberately chosen instead of the commoner ½d. The latter seems to me unbusinesslike. There is no such coin as ½d., and so the next step below 0.5d. for ease in calculations and accounts should surely be 0.4d., and then on to 0.3d. If there is any psychological appeal in "three units a penny," is there any less appeal in "ten units for 4d." or "ten units for 3d."? Surely not, because the ordinary housewife meets it every day when buying fruit and vegetables.

The fixed charge quoted and the total costs of £14.4 for A and £108 for D at once raise the problem of the elasticity—not of the load, but of the consumer's purse. If we consider A (and more than 80 per cent. of the population are A or B) we find that several authorities have determined that A spends from 2s. to 5s. per week on domestic services. This would appear to rule out the "all-electric" house for A, but for the hypothesis on which the costs have been based. Many leading authorities have recently shown (*e.g.*, Mr. J. N. Waite in his recent I.E.E. cooker paper) that the 50 per cent. load factor for domestic electrification is a conservative estimate, and that supply costs fall rapidly when that stage is reached, as such items as management and distribution costs remain almost unaltered.

TABLE 5.

Consumer	A	B	C	D
kWh as in Table 4	4,380	6,570	13,140	32,850
Supply cost at 0.5d. per kWh ...	182.5s.	274s.	548s.	1,370s.
F3.7	0.30d.	0.365d.	0.432d.	0.473d.
F27.3	0	0	0	0.30d.

For B, increment 0.3d. = F5.5; for C, 0.3d. = F11.

The £10 per kVA and 0.25d. per kWh can no longer be used, and if the domestic load factor is 50 per cent. the supply system's load factor may reach 60 per cent., and it would not be too optimistic to assume an overall cost of 0.5d. per kWh (at 50 per cent.) which can conveniently be resolved into £6 per kVA plus 0.17d. per kWh. Table 4 can then be rewritten from this new hypothesis and from table 5 we see that, even with the 0.3d. incremental charge, the fixed charges need only be £3 7s. for A and £27 3s. for D with total costs at £9.1 for A and £68.5 for D.

Fig. 2.—All-electric costs

These results are shown graphically in fig. 2 from which the final conclusions can be drawn. Since presumably table 5 is our goal for the domestic load I would suggest that the fixed charges in fig. 2 provide the foundation on which we should build, and it can be used even now with costs at £10 plus 0.25d. The line, starting from A, has a gradient of 36/600 or 6s. per 100 sq. ft. floor area up to B, and at the D end has a gradient of 9s. per 100 sq. ft. Thus, an equitable fixed charge would be 17s. 6d. per quarter for 500 sq. ft. and under, plus 1s. 6d. per quarter for each additional 100 sq. ft. up to 1,500, and 2s. 3d. per quarter for each 100 sq. ft. above this figure.

On such a foundation, the incremental charges could very well start at 1d. for lighting, 0.8d. for lighting and ordinary power purposes; 0.5d. for the foregoing and in addition *either* cooking or water heating; and 0.4d. for all-electric houses. As development proceeds and supply costs are reduced, the incremental charges can be similarly reduced. At present the tendency appears to have two incremental charges, such as ½d. and ½d. of which the second only operates after a certain consumption independent of the size of the house, or installation, demand or load factor. This is not equitable, especially as consumer A may have to pay an "incremental" ½d. for a cooking (high load factor) unit, while consumer D may pay an "incremental" ½d. for a lighting (low-load factor) unit. Surely the promotional element, that is the lowering of the incremental charge, should operate on the adoption of higher load-factor apparatus as suggested above.

Finally, there is the question of compliance with legal requirements and the provision of a flat rate. This can be derived from the fixed charge foundation and the lighting incremental charge, and using the figures assumed in table 1 the rate will vary from approximately 7½d. for A to 3½d. for D. An intermediate uniform figure of 5½d. or 6d. would then appear to meet the case and provide sufficient leverage for the adoption of the two-part tariff outlined above.

An Italian Electrical Conference

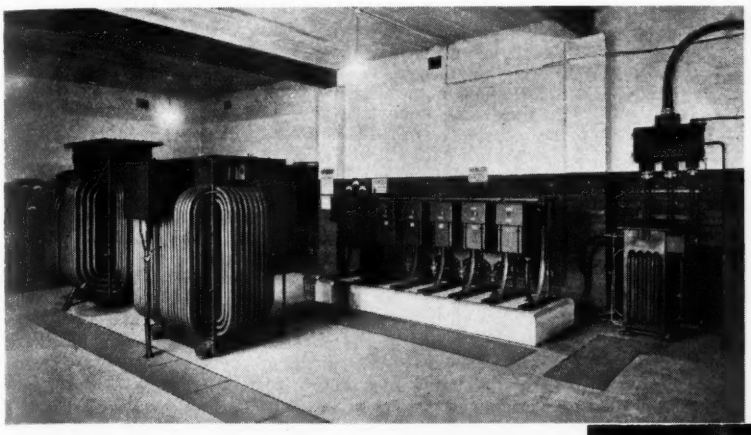
The annual conference of the Associazione Elettrotecnica Italiana, which is to be held in Turin from September 18th to 25th next, is to be largely devoted to electric lighting, electrical acoustics and domestic applications of electricity.

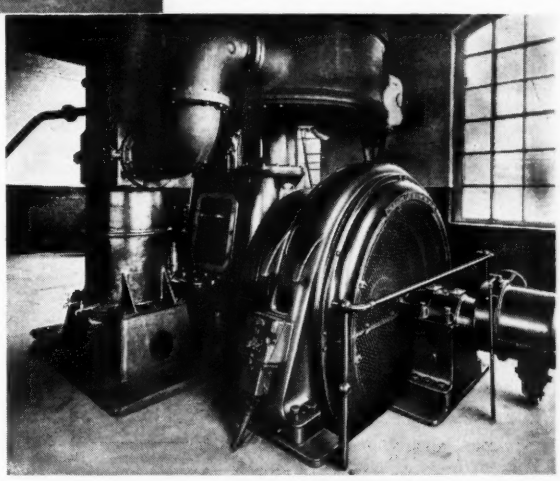
New Equipment at a Colliery

Accelerated production

THE Chamber Colliery Co., Ltd., owns three separate and independent pits, the Oak at Hollinwood, Woodpark at Bardsley, and Ashton Moss at Audenshaw, five miles from Manchester. Each of the three pits works the Roger mine.

Recent reorganisation to interconnect all three pits in this mine in order to improve ventilation and to accelerate production, now approximately 1,100 tons per shift (the equipment at Oak pit, which is chiefly dealt with, is similar to that at the Ashton Moss and Woodpark pits also) included abandonment of the generation of electricity at the pits in favour of taking bulk supplies from the Oldham and Ashton Corporations. Previously, electric power for the screens, pumps, and surface lighting was generated by three 150 kW d.c. generators driven by compound open type steam engines installed before the beginning of this century.





Sub-station at the Oak pit (above) and vertical two-stage compressor direct-coupled to a 585-h.p. slip-ring motor

The contract for all the new electrical plant required to change over from d.c. to a.c. was placed with the General Electric Co., Ltd., including sub-station equipment (comprising high- and low-voltage switchgear and transformers) and motors for pumps, fans, compressors and haulages, together with motor-generator sets for charging the batteries of the electric safety lamps employed in the mine. The vertical steam winding engine at the Oak pit, although almost 100 years old, was giving very satisfactory service and, moreover, consumed all the slurry from the washery settling ponds. It was therefore decided to retain the steam winder.

The Power Supply

The incoming supply at the Oak pit at 6,000 V passes through ring main oil-immersed isolators and a metering panel to the main switch controlling the outgoing feeders to the two transformers. One is of 1,000 kVA capacity stepping down to 3,300 V and controlled by an industrial draw-out oil immersed switchboard, which distributes power to the compressor and shaft feeder. The other transformer is of 500 kVA and feeds a six-panel 400-V distribution board controlling supplies to screens, lamp charging room, washery plant, pump, ventilating fan, and a 50-kVA surface lighting transformer.

Compressed air for mining operations is supplied by a vertical two-stage compressor delivering 3,000 cu. ft. of free air per min. at 100 lb. per sq. in. The compressor is driven at 245 r.p.m. by a 585 h.p. 3,300-V slip-ring motor controlled by a circuit-breaker and liquid starter. The ventilating fan, which was originally operated by a very old steam engine, is now coupled through vee-rope to a 50 h.p., 400-V 900-r.p.m. slip-ring motor controlled by a drum type starter. The fan circulates 50,000 cu. ft. of air per minute against a water gauge pressure of 2 in. Two motors of 15 and 20 h.p. in the same building drive through belting the picking table and cross shaker. During the reorganisation a subdivision was made in the power house to provide a new lamp room. This new room is equipped with charging stands for the batteries and is supplied with d.c. at 110 V from two 2½-kW motor generator sets.

Electric power is taken down the main shaft at the Oak pit at 3,300 V and, while it is intended in the future to take a supply underground right to the coal face, at present power is not taken beyond the pit bottom, where it terminates in two motor haulages, one of 150 h.p. and one of 35 h.p. The main haulage road is of variable gradient, being level in some parts and having a gradient of as much as 1 in 3 for considerable distances in other parts. The roadway is altogether 1,800 yd. long. The larger haulage motor is of the slip-ring type and is controlled by an air-break drum type controller with a reversing switch mounting near the operating handle. There are three mouthings (insets) in the pit shaft where water from old workings accumulates in lodge rooms and is raised to the surface by three-throw ram pumps; these are driven by motors of 50 to 85 h.p. operating at 3,300 V and controlled by oil-immersed rotor starters.

At the bottom of the pit shaft is a sub-station, where the 3,300-V cable terminates at a six-panel distribution board similar in design to those installed in the surface sub-station. The underground sub-station is close to the downcast pit bottom and is thus free from any mining risks. The switchboard controls supplies to the two haulages previously mentioned, and also to transformers for low voltage.

The City and Guilds

The report of the Council to the members of the City and Guilds of London Institute for the year 1937 declares that in recent years financial stringency has made it difficult to keep the electrical engineering equipment of the College up to date. The most urgent need at present appears to be in connection with electrical engineering, and about £60,000 is required. Not only is it highly desirable to provide surge investigations, but in addition new apparatus is necessary for the laboratories concerned with machines, measurements and telecommunications. The entries for all grades of the four subjects grouped under the title of telecommunications again showed substantial increases. In technological examinations overseas electrical subjects, with approximately 2,000 candidates (200 increase), continue to be most popular. Examinations in electrical engineering practice and electricians' courses were again taken by native civilians employed as superintendents at the military stations in India.

Fatality

The *Manchester Guardian* reports that at Salford last week an inquest was held into the death on July 20th of a car salesman, John Bowman, Oldham. It was stated that Bowman was found lying on a car-washing machine although he did not appear to have been using it A motor mechanic said that some days before the accident, noticing that the plug leads of the machine were disconnected, he temporarily connected the plug to a lamp. Later he was told by the proprietor of the garage to reconnect the plug to the washing machine but failed to do so. He denied that he disconnected the plug from the machine in the first place. Mr. G. Wilkes, a Salford Corporation engineer, said that the plugs leads from the machine had been wrongly connected up so that by touching the plug Bowman would have received a shock and then have fallen upon the live frame of the machine.

In returning a verdict of "Death by misadventure," the jury censured the motor mechanic for his carelessness.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

What is Ohm's Law?

Mr. D. J. Pearce has done a service in digging out the details of Ohm's work and what he (Ohm) deduced from his research. What a very fine thing he did with such meagre resources! It is clear that Ohm discovered a characteristic of a certain class of conductors—the metals—and did not claim to have done more. He did not even use the word "resistance."

But in fact Ohm's Law is a generalised law of the electrical circuit. E/C=R is very generally true for any circuit (I am not sure whether that of a thermionic valve is an exception) if one interprets E as the instantaneous algebraic value of all the e.m.f.s in the circuit. R has a very real existence as the value—not necessarily independent of C—which determines the production of non-convertible heat in the circuit. That being so it has always seemed to me that to say that a conductor or a circuit "does not obey Ohm's law" is rather absurd.

It may be remembered that Ohm had no knowledge of the quantitative relation between electrical and heat energy; his work may have helped Joule to do his work in establishing that relation among others. HENRY M. SAYERS.

Beckenham, *July 19th.*

Battersea and the Grid

Supply authorities operating selected stations will note with interest and satisfaction that the controversial Section 13 of the Electricity (Supply) Act, 1926, has been interpreted to the advantage of the Battersea Borough Council who will receive a rebate from the Central Electricity Board on their grid tariff of £5,000 for the year 1936 and £14,000 for the year 1937. Battersea is a two-shift station; and Mr. H. F. J. Thompson, the general manager and engineer, in his report to the Electricity Committee on the negotiations recommends that the C.E.B. offer be accepted despite the fact that the estimates seem to indicate that the Electricity Department is entitled to a somewhat higher rebate. C. J. WOODVILLE.

London, S.W.12, *July 19th.*

The Cleaning of Mercury

With reference to the article in the current issue of the REVIEW on the cleaning of mercury I think a word of warning is necessary regarding the carrying out of certain operations: in particular the boiling of mercury in an open pot on a bright coke fire. This can constitute a serious health hazard.

It is not always appreciated that mercury gives off vapour even at atmospheric temperatures and pressures, and until precautions were taken, workers engaged in making barometers, &c., were subject to mercury poisoning from the vapours given off from splashes of mercury left lying on benches. This being so, when recommending a process involving actual boiling of mercury in an open pot, it would be advisable to draw attention to the dangerous nature of the vapour. T. A. EVANS.

July 23rd.

A Salesman on the E.D.A. Diploma

Rather more than twelve months have now elapsed since E.D.A. introduced a course for salesmen and sales engineers leading to a diploma. The inducement held out was that such a diploma would constitute a recognised and impressive qualification and furnish a definite and serious test of capacity and service. E.D.A. claims that the course has been successful and appreciated. The first diplomas have now been awarded, and it is opportune to examine this claim. We do not find it supported by prospective employers, even members of E.D.A., for in their advertisements they prefer to ignore the very existence of what was to constitute an important asset to the ambitious man. In the light of experience both managers and salesmen are frankly sceptical.

Is it not a fair question to ask whether any serious attempt is to be made to give real effect to the pious expressions of good intention which have led salesmen, seldom in a position to make spontaneously a gratuitous contribution to E.D.A. revenues, to devote time and money to the acquisition of a distinction which seems more than likely to be neither distinguished nor valuable? New entrants appear to be judged on "sales-cases" identical with those originally issued, with the obvious possibility that in the larger undertakings the correct answers will become simply traditional. If the diploma is to be depreciated in this way to a mere formality, then Gilbert's axiom of relative equivalence will apply and—diploma notwithstanding—"no-one's anybody."

Surely an effort is called for from undertakings who maintain E.D.A. to ensure that the standard is not debased and that possession of the diploma does receive adequate recognition. Imposing a standard of ability, however small, has evoked the correlated issue of a standard of fair wages and conditions of employment and it is the plain duty of those undertakings which have been glad to seize the first opportunity to increase the value of their staffs to see that the possession of the diploma involves reasonable remuneration. At the same time it is the opportunity of the salesman to emphasise, as never before, that equality of status has been recognised by the introduction of this training and that recognition of basic wage-rates is overdue and must now follow. Is it too much to hope that as a consequence the salesman may be able to put his case effectively as a member of an organisation?

These questions are the consequence of the E.D.A. course and it is in the evident interest of every past or future candidate to study them and to seek definite assurance that the diplomas will actually count for something and that these assurances will be fully implemented. Little liking as I have for the *nom de guerre* you will no doubt appreciate my reasons for asking you to withhold from publication my name and address and signing myself simply,

July 19th. DISSATISFIED DIPLOMATIST.

Stokers at Portsmouth

We have read with interest your article on page 117 of the current ELECTRICAL REVIEW on the extension at the Gunwharf Road power station, Portsmouth. In the list of main contractors you have mentioned that we supplied an "L" type *retort* stoker. This is incorrect and should read "L" travelling grate stoker. This is the same type as the 726 sq. ft. stokers which we are installing at the Ironbridge station of the West Midlands Joint Electricity Authority.

At the moment these are the largest travelling grate stokers in the world, but we are now building an "L" stoker of 756 sq. ft. for the China Light & Power Co.

INTERNATIONAL COMBUSTION, LTD.

London, W.C.2, *July 22nd.*

Simplified Ventilation for Ships

THE addition of a complete ventilating system to a ship after it has been built, without the use of trunking and without disturbing in any way the existing structure, sounds an almost impossible task. It has, however, just been accomplished in the Blue Star liner *Arandora Star*, in which Axia Fans, Ltd., has installed forty standard Vent-Axia "Silent Nine" fans to serve all the principal public rooms. The fans have been fitted either to the ceilings or the walls, the inter-beam spaces between the false ceilings and the decks above

Above are seen three of the eighteen Vent-Axia ceiling units installed in the ballroom

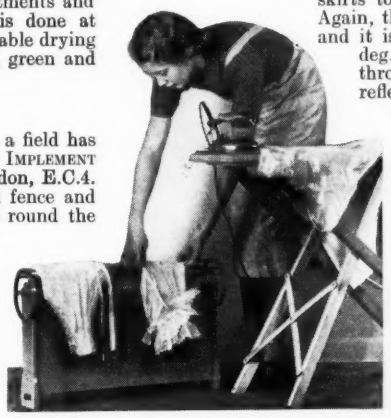
and between the false walls and the bulkheads forming natural ducts. In the case of the rooms on the top decks small holes have been cut in the bulkheads to admit the fresh air, natural ventilators or Axia screw pressure main supply fans being employed to supply the beam spaces of the rooms below deck. It is claimed that, compared with the usual fans, trunking and louvres, this system saves approximately 45 per cent. in horse-power required below decks and 80 per cent. in regard to the top decks. The method of fixing the fans is similar to that employed for the units often seen mounted on glass windows.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Handy Warming Horse

A small and compact convector heater suitable for warming small rooms, halls, staircases and landings, is being made by UNITY HEATING, LTD., Unity Works, Welwyn Garden City. It is particularly suitable for flats, apartments and small households where light washing is done at home, the horse being fitted with a detachable drying frame. It is available in pink, primrose, green and blue. The loading is 1,000 W.



A new Unity convector heater for small dwellings

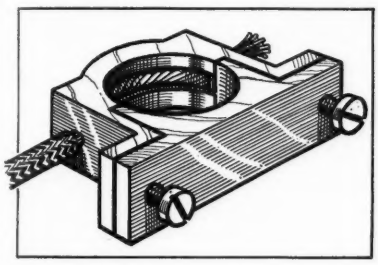
An Electrical Fence

A simple method of keeping animals in a field has been introduced by the HARVEST SAVER & IMPLEMENT CO., LTD., 77, Queen Victoria Street, London, E.C.4. It is known as the "Prime" electrical fence and comprises a length of barbed wire to go round the field. It is energised by a 6-V accumulator through a make and break device and shocking coil. The power is not sufficient to be harmful but will certainly keep the animals away from the fence.

Where a gate is normally employed all that is necessary is a hook in the wire with an insulated holder. The animals are taught to avoid the fence by placing food just beyond the wire. As they touch the wire they will get a shock, and after one or two attempts to reach the food will not touch the wire again.

An Earthing Clip

TURNOCK & KEEGAN, 52, Alma Street, Birmingham, 6, have sent us a sample of a new earthing clip. It is substantially made of solid brass and has a straight line insert for the cable.



The Turnock and Keegan earthing clip

The pressure for forming to the shape of the tube is derived by means of a screw, thus giving accessible means of fixing. The clip can be made for any size of tube and will take wire, cable or strip conductor.

Industrial Lighting Reflectors

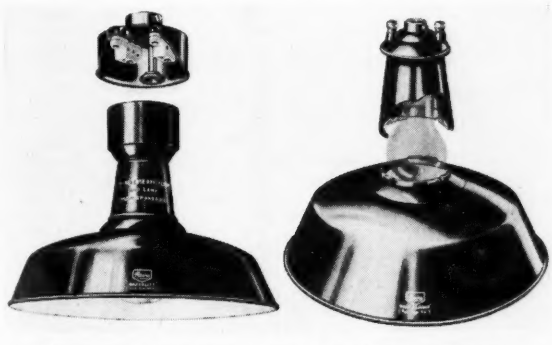
We have received from the REVO ELECTRIC CO., LTD., Tipton, Staffs, details of the "Saferlite" and "Passalamp" industrial lighting reflectors which are now about to be placed on the market.

The "Saferlite" has been designed to ensure a safe temperature for flexible leads. Its main feature is that the complete assembly of the reflector and lamp can be instantly detached by a simple movement. There are thus no screws or nuts to manipulate and no intricate parts to wear or need adjustment.

Accessible porcelain terminal blocks are provided in the head and wiring is easy and quick with the reflector detached. An earthing terminal is provided and leads are isolated from the heat and never attain a temperature detrimental to the insulation. Skirted shockproof lampholders are provided.

These reflectors are now available for all sizes of gasfilled lamps, in dispersive, distributing, concentrating, concentrating angle, vertical, elliptical, and elliptical angle types. Distributing, dispersive and angle types are also available for 80-, 125-, 250- and 400-W mercury vapour lamps, and 50-W sodium lamps.

"Passalamp" reflectors are designed to enable the reflector skirts to be detached for cleaning over the lamp. Again, there are no nuts and screws to manipulate and it is only necessary to rotate the reflector 60 deg. to remove or replace it. It cannot fall through vibration. At present, this series of reflectors is confined to dispersive type (to B.S. specification) with 1¼-in. hole for lampholder for lamps of 60 and 100 W and also in a dispersive weatherproof pattern for lamps of 100 W to 500 W.



The Revo "Passalamp" and "Saferlite" reflectors

High-quality Radio Receiver

FERRANTI, LTD., Moston, Manchester, 10, announce the introduction of a moderately priced, high-quality, a.c. all-wave superheterodyne receiver with push-pull output. Especially good reproduction is possible with the receiver adjusted for broad tuning to receive only six powerful stations. Manual control is also available in addition to automatic tuning by press-button control.

Controlled-heat Electric Iron

The "Silver Arrow" controlled-heat iron, a new introduction by the LIGHTFOOT REFRIGERATION CO., LTD., Abbeydale Road, North Circular Road, Wembley, has a redesigned type of element. The thermostat pointer is marked according to the nature of the work to be ironed and also has an "off" position.

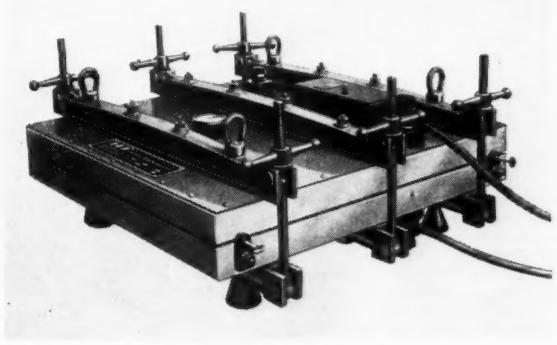
Other features are an attractive black and chromium finish with sole plate grooved for pleats and buttons, heel rest embodied in the iron, finger-tip control on the dial, and permanently connected three-core flex. Even distribution of heat over the entire sole plate is obtained with any setting of the dial. The rated loading is 1,000 W, the working temperature being attained in approximately 90 seconds. The iron is available for a.c. supplies only.

The "Silver Arrow" iron

An Electric Vulcaniser

A new type of electric vulcaniser for joining conveyor belts up to 25 in. wide and driving belts up to 15 in. wide has been introduced by HARVEY FROST & CO., LTD., Bishop's Stortford. It has two platens comprising two aluminium silicate alloy box castings strengthened by symmetrically placed webs on the interior. Heating is by sixteen 400-W "Chromalox" elements fitted between these webs. The requisite temperature for vulcanising is indicated by a green light on the dial of a recording instrument. Then the temperature is uniformly maintained by a bi-metal thermostat in each platen operating a vacuum chamber, thereby precluding any possibility of shorting. Each of these thermostats operates in turn a hot wire vacuum relay switch.

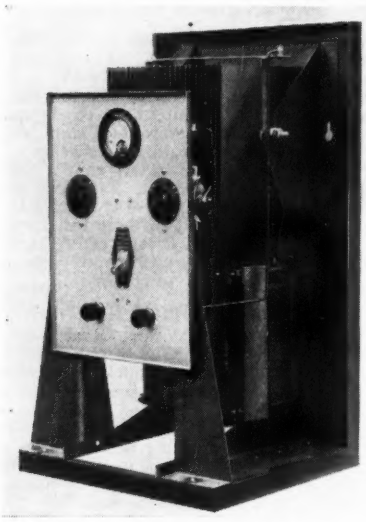
The surfaces of the platens are machine finished and further reinforced by six cast-iron beams to ensure intimate and uniform pressure. Each platen is fitted with a 15-A "Niphan" water-tight plug and socket with 10 yd. of c.t.s. cable.



The Harvey Frost vulcaniser

Vehicle Battery Charger

A new type of dry metal unit—a selenium-oxide combination—is employed in the latest vehicle battery charger which is being manufactured by PARTRIDGE, WILSON & Co., LTD., Davenset Works, Leicester.



The "Davenset" type D.G.C.1 battery charger

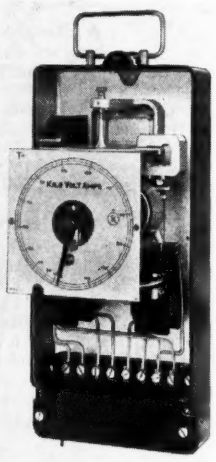
The new equipment is an alternative to the "Davenset" hot cathode valve battery charger which, although less expensive, does not possess the advantage of containing a permanent rectifying unit, which the "Drimet" offers. An improved form of cubicle construction is employed, the case of the instrument being made from pressed and rolled sheet steel, giving strength with minimum weight.

A range of garage equipment has been produced to meet the requirements of commercial battery charging, a representative model of which is the type D.G.C.1 (illus.) and a complete range for electric vehicle charging is in the course of preparation.

The type D.G.C.1 unit is designed for recharging motor-car starter batteries, the a.c. input being normal single phase supplies, giving a d.c. output of 75 V, 8 A. Control of the output voltage is by coarse and vernier tapping switches from one to thirty 2-V cells. Automatic overload protective switchgear is incorporated.

A Modified kVA Indicator

The design of the declared-voltage pattern of the Hill-Shotter "A" type maximum demand indicator has been revised by ARON ELECTRICITY METER, LTD., 72-82, Salusbury Road, London, N.W.6.



The Aron kVA indicator

Size and weight and electrical losses have been reduced and synchronous motor tripping replaces the Ferraris motor method, although relay tripping can be arranged for. The principle of operation is that when the electromagnets are energised by currents in series with the load, the driving torque set up by the copper shading rings causes the rotating element to turn at a speed that is controlled by the braking action of the permanent magnet and also of the fluxes in the driving electromagnets. These braking effects are designed to be equal at full load and their combination results in uniform graduations on the kVA indicating scale, above about one-fifth of full load. As measurement is on the basis of the arithmetical sum of the products of the current in each of the three phases and the declared star voltage, the use of three current transformers is desirable.

In the three-phase model the instrument operates within the usual limits of accuracy so long as the current in any phase does not differ by more than 50 per cent. from the mean value of the currents in the other two phases. Beyond this point the use of three single-phase instruments is recommended. Full load (three-phase) torque is given as 7.0 gr. cm., full-load speed as 40 r.p.m., series losses as 2.5 VA per current element and shunt losses as 2.8 VA. The weight of the complete meter is 12 lb. 8 oz.

New Domestic Cooker Design

AMONG recent developments in the domestic field is a new cooker by ELEXCEL, LTD., Victor Works, Broad Green, Liverpool, 14, known as the "Xcel Type EH 381." This has been constructed so as to incorporate the special requirements of a customer.

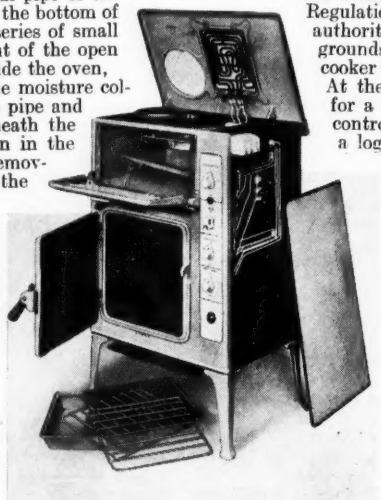
It comprises the following special features: Permanently open oven ventilation with a patented form of steam condenser device; low temperature plug-in mica type oven elements; tubular sheathed radiant type griller-boiler (2,000 W); fuses reached by raising hob; thermostatic control of oven optional; and main switch incorporated in cooker switchbox. A spare switch position is provided in the switchbox for a kitchen water heater switch.

The new type of ventilation and condenser comprises a number of permanently open holes in the front frame below the oven door, through which cold air is drawn over the bottom elements and passes up each side over the side elements. At the top back of the oven is a permanently open outlet to which is connected on the outside of the oven a ¾-in. down pipe terminating in a horizontal pipe of the same diameter about 10 in. long, level with the bottom of the cooker and having in its underside a series of small holes. The steam from the oven passes out of the open vent into the down pipe which, being outside the oven, is cold enough to condense the steam. The moisture collects in the horizontal portion of the down pipe and drops into a removable tray arranged beneath the oven. These ventilation holes can be seen in the illustration below the oven door and the removable drip tray which extends over almost the whole of the under surface of the oven.

The manufacturers claim for this scheme that it provides greatly improved heat circulation within the oven itself, and better cooking in the more evenly distributed temperature and that "steaming" trouble is overcome.

The mica elements are both quick in initial heating and cheap to replace. They are arranged horizontally on cast-iron frames and are made to plug in, one frame plugging in on each side and one at the bottom.

It is also claimed for the combination of these oven elements with the new ventilation scheme that the impinging of the cold intake air on to the elements gives a lower element temperature than could otherwise be obtained.



The "Xcel Type EH 381" cooker

The 2,000-W radiant tubular sheathed griller-boiler makes a second boiling plate unnecessary. A polished aluminium deflector plate is provided below the griller-boiler for use in the same way as the polished aluminium plate below the boiling plate. This deflector can be removed and used on top of the grill boiler if required when grilling.

The fuses are in the top of the switchbox and accessible by raising the hob.

The cooker is made so that it may be converted to thermostatic oven control with the least possible trouble. The original three-heat oven switch is provided with a self-indicating switch knob so that the only wording which need appear on the switch panel is "Oven," then when converting to thermostatic control the self-indicating switch knob is replaced by the self-indicating dial knob of the thermostat. The thermostat is of the "Satchwell" type and is complete with low-voltage indicator lamp and shunt resistance.

A d.p. rotary main switch is incorporated in the switchbox on the top of the switch panel. Although the inclusion of this switch on the cooker is contrary to the I.E.E. Regulations, the makers find that a number of authorities still prefer it on the cooker, on the grounds that it is cheaper than the wall-type cooker control unit and does not damage the wall. At the bottom of the switch panel is a position for a spare rotary switch which can be used for controlling the kitchen hot water; this carries to a logical conclusion the grouping of all kitchen switches. The loadings are 2,250 W for the oven, 1,050 W for the 7-in. diameter boiling plate, and 2,000 W for the griller boiler (9 in. by 7 in.). Dimensions are: Oven cooking space 12½ in. high by 13 in. deep by 12 in. wide, the overall dimensions being 36 in. high by 18 in. deep by 23½ in. wide.

The same company has also introduced two cookers with a removable box type interior and fixed radiant refractory type elements mounted on bus-bars, the front frame casting having been redesigned to do away with the separate white switch panel which used to be standard. Instead of this, each switch is now arranged with its own separate removable indicating dial. Both the cookers are arranged for manual or thermostatic oven control and can be very quickly converted.

Power Station Staffs' Salaries

Existing rates maintained

AS we state in our leading article, the supplementary schedule of salaries for electricity supply undertakings' staffs is now to be subject to variation according to the cost of living. The revision is made half-yearly upon the average Ministry of Labour cost-of-living figure for the previous six months. As this average for January-June this year was practically the same as that upon which the supplementary schedule was based, the result is that the existing rates will continue until the end of this year when they will come under review. For readers' information we print herewith abbreviated version of the schedule giving the salaries payable to the nearest £. The letters appearing in each class show (a) the salary for the first two years of service; (b) for the next two years; and (c) for after the fourth year. Certain of the grades bear definite descriptions:—1 is deputy chief official; 3, power station superintendent or mains superintendent (with charge of sub-stations; (4) mains superintendent (without charge of sub-stations); 8, shift charge engineer; 8b, sub-station charge engineer; 9a, switchboard attendant.

The variations, additions and amendments provided for in the 1923 agreement remain in force. For instance, employés in the London area are entitled to an addition of 5 per cent. and in any district where conditions justify lower remuneration a deduction of 5 per cent. can be made by agreement.

THE SCHEDULE OF SALARIES

(Capacity or maximum demand in kW.)

Grade		1	2	3	4	5	6	7	8	8a	8b	9	9a	10	10a	10b	10c	11	11a	11b
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Class A 1,000–2,000	a	476	412	370	316	298	269	242	242	225	208	—	—	—	—	—	—	—	—	—
	b	487	421	378	327	306	28	251	242	225	208	—	—	—	—	—	—	—	—	—
	c	499	432	388	339	314	289	260	242	225	208	—	—	—	—	—	—	—	—	—
Class B 2,001–4,000	a	510	441	396	350	323	300	269	242	225	208	—	—	—	—	—	—	—	—	—
	b	526	456	410	358	333	306	280	251	232	215	—	—	—	—	—	—	—	—	—
	c	543	470	424	367	344	314	289	260	239	221	—	—	—	—	—	—	—	—	—
Class C 4,001–6,000	a	559	484	437	374	354	321	300	269	246	227	208	—	—	—	—	—	—	—	—
	b	569	494	445	386	361	330	305	278	254	233	213	—	—	—	—	—	—	—	—
	c	579	503	454	398	369	341	310	286	261	239	218	—	—	—	—	—	—	—	—
Class D 6,001–8,000	a	590	512	461	410	375	350	316	295	269	245	223	208	—	—	—	—	—	—	—
	b	604	526	475	421	386	356	325	300	275	250	229	213	—	—	—	—	—	—	—
	c	618	540	487	432	395	363	334	305	281	257	235	219	—	—	—	—	—	—	—
Class E 8,001–13,000	a	—	554	501	443	406	369	343	310	286	262	241	224	208	—	—	—	—	—	—
	b	—	569	507	450	416	378	351	319	294	270	246	227	208	—	—	—	—	—	—
	c	—	583	514	456	428	389	361	327	303	278	254	250	208	—	—	—	—	—	—
Class F 13,001–25,000	a	—	—	521	462	438	398	370	336	310	285	260	233	208	—	—	—	—	—	—
	b	—	—	533	479	444	408	374	344	318	292	267	238	212	—	—	—	—	—	—
	c	—	—	547	495	451	416	379	351	325	299	273	242	216	—	—	—	—	—	—
Class G 25,001–50,000	a	—	—	559	511	457	426	384	359	332	305	280	247	220	208	—	—	—	—	—
	b	—	—	573	523	472	436	397	364	337	311	286	254	225	213	—	—	—	—	—
	c	—	—	588	534	486	445	411	368	343	318	293	260	250	218	—	—	—	—	—
Class H 50,001–100,000	a	—	—	602	546	502	455	424	372	348	324	300	266	235	223	208	—	—	—	—
	b	—	—	622	560	511	469	432	384	358	332	306	274	241	229	213	—	—	—	—
	c	—	—	642	575	522	483	440	396	368	341	314	281	249	234	218	—	—	—	—
Class J 101,001–150,000	a	—	—	661	590	531	498	448	408	378	349	321	288	257	240	223	208	—	—	—
	b	—	—	679	605	546	511	460	419	389	359	329	297	264	246	229	213	—	—	—
	c	—	—	696	621	560	525	472	430	399	369	339	304	271	253	235	219	—	—	—
Class K 150,001–200,000	a	—	—	714	636	574	538	484	441	410	378	348	313	279	260	240	224	208	—	—
	b	—	—	733	654	590	552	498	454	421	389	357	322	286	267	246	230	213	—	—
	c	—	—	751	670	605	567	510	465	432	399	367	330	295	275	253	236	219	—	—
Class L 200,001–250,000	a	—	—	770	687	620	581	524	478	443	410	376	340	303	282	260	241	224	208	—
	b	—	—	790	705	636	596	538	490	456	421	387	349	311	289	267	246	230	213	—
	c	—	—	811	724	653	612	551	503	467	432	397	359	320	298	275	254	236	219	—
Class M Over 250,000		—	—	831	742	670	628	566	516	480	443	408	369	328	305	282	260	241	224	208

American Electrical Exports

HAVING increased in value by at least 20 per cent. between 1935 and 1936, the export trade in electrical goods of the United States last year showed a further advance of nearly 25 per cent. The table shows the value of all the principal items in a very full and interesting classification with a note of increases or decreases compared with 1936.

	1937. $ (000).	Inc. or dec. on 1936. $ (000).
Generators, d.c.	512	+ 167
Generators, a.c.:		
Under 2,000 kVA.	366	+ 120
2,000 kVA. and over	700	+ 584
Steam turbine generator sets	343	+ 88
Accessories and parts for generators	589	— 96
Arc welding sets	1,060	+ 340
Self-contained lighting outfits	1,775	+ 1,125
Batteries, 6 V and 12 V storage	1,828	+ 605
Other storage batteries	995	+ 400
No. 6 dry-cell batteries	225	+ 29
Flashlight batteries	2,817	+ 517
Radio B. and C. batteries (dry)	512	+ 60
Other primary batteries	190	+ 53
Power transformers, over 500 kVA	437	+ 83
Distribution transformers, 500 kVA and less	649	+ 201
Instrument transformers	122	— 25
Other transformers	422	+ 33
Complete battery chargers, non-rotating	234	+ 89
Double-current and motor generators, dynamotors, synchronous and other convertors	686	+ 157
Switchboard panels, except telephone	560	+ 150
Power switches and circuit-breakers over 10 A	1,492	+ 390
Fuses	193	+ 55
Watt-hour and other measuring meters	772	+ 326
Electrical indicating instruments	808	+ 275
Electrical recording instruments	341	+ 67
Other electrical testing apparatus	1,227	+ 277
Lightning arrestors, choke coils, reactors and parts	640	+ 190
Motors, ¼ h.p. and under	883	+ 203
Motors over ¼ h.p. and under 1 h.p.	346	+ 50
Stationary motors, 1–200 h.p.	1,839	+ 489
Stationary motors, over 200 h.p.	283	+ 167
Railway motors	305	+ 165
Railway electric locomotives	99	— 15
Mining and industrial electric locomotives	746	+ 316
Station and warehouse electric motor trucks	263	+ 101
Starting and controlling equipment for industrial motors	1,545	+ 375
Ditto for elec. railway and vehicle motors	264	— 486
Portable electric tools	1,232	+ 322
Accessories and parts for motors	1,933	+ 273
Refrigerators, household	12,771	+ 1,031
Refrigerators, commercial, up to 1 ton	2,480	+ 248
Parts for electric refrigerators	5,420	+ 249
Flashlight cases	918	+ 247
Electric fans	623	+ 73
Lamps for automobiles, flashlights and Christmas trees	448	+ 88
Other metal-filament lamps	1,050	+ 224
Other electric lamps	50	— 90
Searchlight and airport beacons	52	+ 24
Floodlights	157	— 23
Household washing machines	2,100	+ 1,034
Household washing machine parts	132	+ 82
Domestic vacuum cleaners	530	+ 20
Domestic vacuum cleaner parts	347	+ 49
Other domestic motor-driven devices except tools	807	+ 174
Electric flatirons	342	+ 117
Electric cooking ranges	400	+ 35
Domestic electric heaters and ovens	164	*
Other domestic electric utensils	652	*
Industrial electric furnaces, ovens and other heating devices	835	+ 219
X-ray tubes	335	*
Other X-ray apparatus and parts	1,326	+ *
Other therapeutic apparatus	361	*
Radio transmitting sets, tubes and parts	2,684	+ 864
Receiving sets	16,129	+ 89
Receiving tubes	4,063	+ 549
Receiving set components	7,457	+ 1,797
Loudspeakers	888	+ 182
Other receiving set accessories	881	+ 341
Telegraph apparatus	503	+ 276
Telephone instruments	260	+ 74
Other telephone equipment	3,020	+ 1,180
Starting, lighting and ignition equipment	1,437	+ 117
Insulating material	412	+ 62
Metal conduit, outlet, and switch boxes	1,083	+ 458
Sockets, fuse blocks and lighting switches	1,021	+ 246
Interior lighting fixtures	1,143	+ 87
Exterior lighting fixtures	232	+ 62
Other wiring supplies and line material	1,019	+ 282
Electric razors	199	*
Other electrical apparatus, unspecified	7,421	+ 1,643
Insulated iron or steel wire and cable	158	+ 108
Rubber insulated copper wire and cable	2,047	+ 942
Weatherproof wire	474	+ 204
Telephone cable	74	+ 20
Other insulated copper wire	1 266	+ 406

* Comparative figures not available.

Business and Industrial Notes

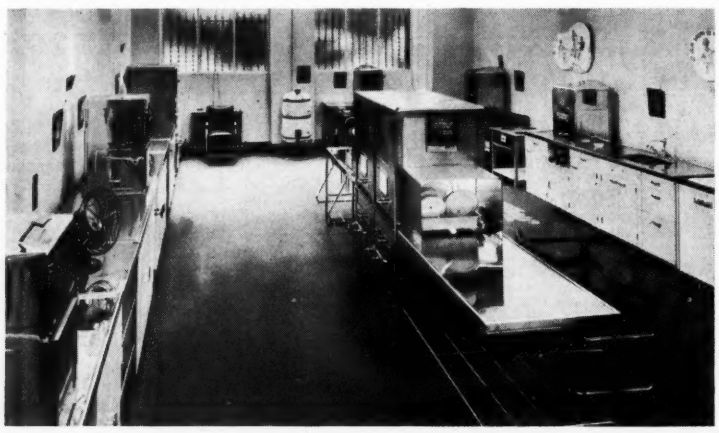
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Electrical Propaganda in London

Negotiations have been completed between London electricity undertakings and the London Passenger Transport Board whereby a concentrated publicity scheme, costing nearly £25,000, will be begun shortly on the Board's central buses, trolley-buses and tramcars. This is the first occasion on which London undertakings (the majority of the municipalities and all the companies are interested) have joined forces to point out to the public why electricity should be used for all domestic purposes, and the scheme must be among the most comprehensive ever presented in one campaign by any industry. On behalf of the authorities, the negotiations have been supervised by a committee of fourteen under the chairmanship of Mr. A. E. McKenzie, chief electrical engineer and manager at Wimbledon, while credit for the preliminary work is due to Mr. J. D. Spark, hon. secretary of the Associated Municipal Electrical Engineers and chief electrical engineer and manager at Willesden, and Mr. H. J. Randall, secretary of the London Electricity Supply Association and manager and secretary of the City of London Electric Lighting Co., Ltd.

New Lamp Works for South Africa

It is understood that Lampe Delta, S.A., of Brussels, one of the largest Belgian electric lamp manufacturers, is to establish a factory in South Africa. Up to 3,000,000 lamps of every description will be produced, and an initial local staff of 160 is to be engaged. Experts for key positions will be brought from Europe. Mr. P. Palache, general sales manager of the Delta works, will probably superintend activities in the Union, while H. Polliack and Co., Ltd., Johannesburg, will act as distributors. Production is due to commence early next year.



The new Hotpoint dish-washing machine showroom at Crown House, Aldwych

Next Year's B.I.F.

Applications for space in the Engineering and Hardware Section at Birmingham of next year's British Industries Fair have so far been received from 625 firms, for an area of 273,000 sq. ft., compared with 612 applications for 257,000 sq. ft. at the corresponding date a year ago.

The Radio Exhibition

The radio exhibition organised annually by the Radio Manufacturers' Association is to be held at Olympia this year from August 24th to September 3rd. In addition to the normal television programmes from Alexandra Palace there will be special programmes from Olympia.

Television and the Cinema

Addressing delegates to a conference of the National Association of Theatrical and Kine Employees on Monday Mr. Robert Finnigan, the general president, expressed the view that Mr. Oscar Deutsch made no wild prophecy when he stated that the time was quite close when three hundred cinemas in the United Kingdom would be equipped for exhibiting television. Possibly the finest brains in the country had been devoted to the perfection of the new development.

Employment in June

Employment declined slightly between May 16th and June 13th in most of the principal sections of the engineering industry but was fair on the whole and good in electrical engineering. According to the *Ministry of Labour Gazette* the number of unemployed in the engineering industry was 81,100, which was 8,579 more than in May and 39,820 more than in June, 1937. The percentage out of work was 7.8, against 7.0 in May and 6.9 in June, 1937. In electrical engineering the number unemployed was 6,288 or 5.5 per cent., compared with 5.3 per cent. in May and 2.9 per cent. in June, 1937. A total of 4,481 were out of work in the electrical wiring and contracting industry: this represented 10.9 per cent., 0.1 more than in May and 0.9 per cent. more than a year before. In the electric cable, apparatus, lamps, &c., group the figures given (16,122 or 10.9 per cent.) show increases of 0.1 and 4.8 per cent. respectively over those for May, 1938, and June, 1937.

The F.B.I. Business Forecast

According to the "Business Forecast" for the third quarter of 1938 contained in the *F.B.I. Business Barometer*, the recent technical recovery in commodity and stock markets and the prospect of renewed activity in the U.S.A. following President Roosevelt's second "pump-priming" programme, has imparted a much needed stimulus to confidence. This is to be welcomed, provided it is recognised as an interruption only of the underlying cyclical trend and not mistaken for real recovery.

Showroom for Llandudno

Llandudno Electricity Committee has appointed a sub-committee to consider the provision of an electricity showroom in the town.

Polish Electrical Imports

Imports of electrical machinery and apparatus into Poland in May totalled 4,141,000 zloty.—*Board of Trade Journal.*

A Dish-washing Machine Showroom

A large new showroom to be used almost exclusively for the display of the company's dish-washing machines has just been opened by the Hotpoint Electric Appliance Co., Ltd., at Crown House, Aldwych. Examples of all four sizes of the machine are on view in various forms and combined with other scullery equipment. Models with teak or stainless steel tubular frames, composite units complete with a sink and "Disposall" attachment, and several types with cupboards beneath are among the apparatus arranged round the walls, while as a centrepiece there is the largest model made, the "D.60," with its double tank giving two-stage washing and rinsing. For installations where the existing hot water supply is not adequate a 30-gal. booster tank fitted with a 3-kW immersion heater is available, there also being a representative display of circulators and thermostats. A new 4-kW water heater of the geyser type, a new washing machine incorporating a hydro-extractor, a four-plate commercial boiling table, a snack bar griller, a commercial refrigerator and an exhaust fan are other specimens of the company's products included in the display. Mr. H. L. Walker is in charge of the new showroom.

Polish Railway Electrification Contract

The *Financial Times* understands that negotiations are on the point of completion for a contract between the Polish Government on the one hand and Metropolitan-Vickers Electrical Co., Ltd., and English Electric Co., Ltd., for further railway electrification in the neighbourhood of Warsaw. The proposed contract is to involve chiefly the extension of electrification to additional lines on the right bank of the Vistula.

The Great Yorkshire Show

In addition to those companies mentioned in our last week's issue, Brook Motors, Ltd., had a stand at the Great Yorkshire Show. The company's demonstration van was also present.

Electrical Construction Boom in Germany

Reviewing the position of the electrical manufacturing industries in the country, a report recently published in Germany states that since the period of worst depression in 1932 the number of men employed has doubled and the number of man-hours worked has increased by 181 per cent. According to reports of the electrical industry's central body (Wirtschaftsgruppe Electro-Industrie) the value of electrical apparatus sold at home is 155 per cent. higher than in 1932, though the value of exports has decreased by 17 per cent.

The most important internal demand is for heavy apparatus, especially for high-voltage interconnection work and railway electrification, and the development of the Austrian water-power resources will further increase this type of demand. Good business is also being done in smaller dynamos and in magnetos for motor-cars.

Increased Consumption of Aluminium

Preliminary figures for the consumption of aluminium in the United Kingdom in 1937 are given by the Aluminium Information Bureau as 44,000 long tons, which is 28 per cent. more than in the preceding year and over 2¼ times more than in 1928. The increase of 28 per cent. compares with an advance

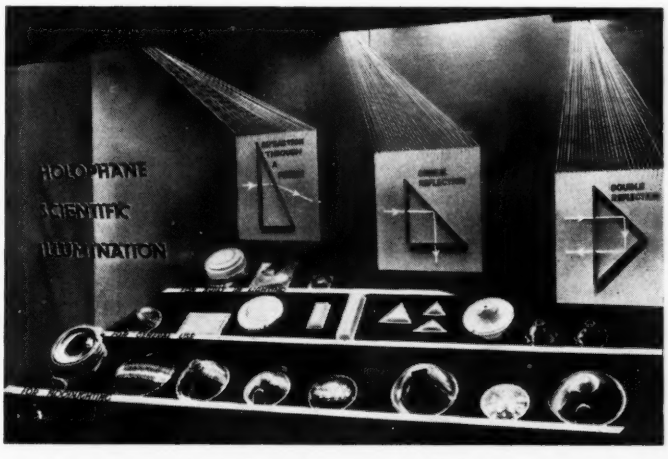
of 20 per cent. in the consumption of copper and of nearly 19 per cent. in the consumption of tin. Lead showed a slight decrease, while the use of zinc increased by 3.7 per cent.

For Sale

Halifax Electricity Department has boilers, &c., for sale.
Bolton Electricity Department offers steam-raising units.
(See our advertisement pages to-day.)

Light Control by Prisms

A special window display designed by the Reimann School to illustrate the company's system of scientific illumination is at present to be seen at the showrooms of Holophane, Ltd., in Elverton Street, S.W.1. Use is made of white and colour lighting to demonstrate light control by different kinds of prisms. A group of white threads, floodlighted to represent light rays, leads the eye of the observer to the illustrations on the back of the window, which indicate the action of a light ray in passing through different classes of prisms. The white lines illustrating the rays through the prisms are shown in red colour-lighting, thus emphasising the direction of the light. The bottom of the window, which is dressed in matt black velvet, has a series of different types of Holophane glassware, arranged in three groups. This method of educating the public to understand the principles of prismatic light control by means of decorative lighting effects has already had almost gratifying results.



The principles of prismatic light control are clearly demonstrated by this Holophane window display

Works Visit

Thirty-six members of the technical staff of British Insulated Cables, Ltd., Helsby, visited the works of Brookhirst Switchgear, Ltd., Chester, a few days ago.

The Tunbridge Wells Agricultural Show

At the Tunbridge Wells Agricultural Show held last week the Tunbridge Wells Corporation, the Weald Electricity Supply Co., Ltd., and the Sevenoaks and District Electricity Co., Ltd., co-operated in the preparation of an electrical exhibit. An interesting display of agricultural and domestic appliances was shown and the travelling showroom of the County of London Electric Supply Co., Ltd., and its associated companies was present.

Success of Finchley Cooker Scheme

Remarkable success has attended the Finchley Electricity Department's "free" cooker scheme which was introduced on April 1st, 1937. Within four months no fewer than a thousand cookers were connected and now Mr. C. R. Westlake, the general manager and engineer, notifies us that the three thousandth cooker has just been installed. A decorated lorry displaying the cooker toured the borough before the installation and afterwards for four days the display was continued with the advertised figures adjusted as further orders were obtained. In the evenings the lorry was parked in a prominent position and floodlighted. The cookers, complete with aluminium utensils, are supplied and installed without any further charge under a two-part tariff. Since the development scheme was commenced the following applications have been received for hired appliances: Water heaters (including immersion heaters), 1,030; wash boilers, 502; radiators, 1,440; and electric kettles, 512. The accompanying photograph is reproduced by permission of the *Finchley Press*.

Delivering the three thousandth electric cooker to be installed under the Finchley Electricity Department's "free" cooker scheme

Social Events

The annual J. & P. sports meeting was held last Saturday at the company's sports ground at Kidbrooke. Mr. G. Leslie Wates (chairman), Mr. Charles Stewart (director), and Mr. P. V. Brittlebank (general sales manager), were among those present, together with a representative gathering of the company's engineers from the branch offices. The prizes were presented by Mrs. Wates and "all the fun of the fair" rounded off an enjoyable day.

Judging from the amusing souvenir number of the *Thermochat*, the employés of the British Thermostat Co., Ltd., spent a very happy day at Ramsgate and Margate recently on the occasion of the company's annual outing.

For their annual outing last week-end the staff of G. and A. J. Cross, Ltd., of Tunbridge Wells, visited Paris, the programme including a voyage up the Seine, inspection of the decorations in honour of the visit of the King and Queen, and a tour of the various places of interest in the city. After a luncheon provided by the firm, Mr. Barham proposed a vote of thanks to Councillor Cross, who presided, for arranging and making the outing possible.

Over 3,000 people were present at the "Clesco" (County of London Electric Supply Co., Ltd., and its associated companies) inter-companies athletic championship meeting held at Raynes Park last Saturday. Twenty-two companies competed. Lady Renwick distributed the prizes and Sir Robert Renwick, vice-chairman of the County Co., said that the teams present at the meeting represented electricity undertakings handling one-tenth of the whole of the electricity generated in Great Britain, and were responsible for £36,000,000 of capital. At the end of 1937 there were 10,000 employés and 586,000 consumers, the mileage of transmission and distribution cable being well over 9,000 miles, equivalent to the distance from London to China.

The annual sports day of Bakelite, Ltd., held last Saturday, was made the occasion for the opening of a new sports ground and pavilion at Elmdon by Mr. H. V. Potter, the managing director. Till recently the company has had a ground adjoining the works at Tyseley, but the whole of the thirty-acre site there is now required for factory buildings. A twenty-seater motor coach has been provided to transport employés to the new ground which is ten miles from Birmingham and covers an area of ten acres. An imposing pavilion measures 100 ft. long by 30 ft. wide.

A varied programme of events attracted large entries at the Chloride Electrical Storage Co.'s sports last Saturday, brilliant weather contributing to the success of the meeting.

Trade Announcements

A. J. Andrews, wholesale electrical supplier, has removed to 167, Priory Road, Hornsey, N.8 (telephone: Mountview 2437).

Frank Riddiough & Son, Ltd., Bradford, have been elected to membership of the Electrical Wholesalers' Federation.

Lionel Robinson & Co., Ltd., are returning to 3 and 4, Staple Inn, Holborn, W.C., on August 3rd, following the completion of repairs to the buildings.

Mr. C. T. Anderson, Cardiff representative of Lighting Trades, Ltd., has moved to "Restcote," Sherbourne Avenue, Cyncoed, Cardiff.

Annual Holidays

From to-morrow (Saturday) until August 8th the works of Johnson & Phillips, Ltd., will be closed.

The factory of the Standard Fuse Co. will be closed from to-morrow, Saturday, until August 8th.

The works of the Union Lamp & Lighting Co., Ltd., will be closed from July 30th to August 8th, inclusive.

The Revo Electric Co., Ltd., is closing its works from this evening (Friday) until August 8th.

E. N. Bray, Ltd., are closing their works and offices from this evening (Friday) until August 8th.

The works of Birkbys, Ltd., will be closed from August 26th until September 5th.

Training of Demonstrators

Mrs. C. G. Morley New presented certificates to students of the London School of Electrical Domestic Science at their end-of-term gathering on July 22nd, Mr. J. W. Beauchamp presiding. Reviewing recent developments, Miss H. M. M. Minoprio, principal of the school, said that since the Easter term forty-six students had completed their training and forty-three had obtained posts in the electrical industry. She hoped that by September extensions to the school would be completed, enabling 50 per cent. more students to be accommodated.

Swedish Electrical Machinery Exports

According to the *Swedish Economic Review* exports of electrical machinery during the first four months of this year amounted to 10,166,000 kr. in value as compared with 8,739,000 kr. in the corresponding period of 1937. For the same period telephone and telegraph apparatus exports increased from 2,431,000 kr. to 2,912,000 kr.

An Accessories Catalogue

The latest accessories catalogue of the General Electric Co., Ltd., contains 150 pages and 500 illustrations. This is sixty pages more than the previous edition which appeared in 1934, another praiseworthy feature being the inclusion of a number of coloured plates to illustrate the various coloured finishes available for the switches in metal covers and with "Roanoid" and "Ivoride" covers. Almost every kind of installation accessory used in the electrical trade is listed and illustrated in this catalogue, there being 1,700 items listed.

New Zealand Electrical Imports

Figures compiled by the Census and Statistics Department, Wellington, show that for the year ended March 31st last the value of imports of electrical goods increased from £(N.Z.)1,986,189 to £2,784,833. Wireless apparatus imports were valued at £596,538 as compared with £506,425.

Low H.p. Motor Applications in Business Premises

An interesting example illustrating the wide range of applications to which Crompton Parkinson fractional and low horse-power motors can be put in office buildings, &c., is the installation recently carried out at the new London showrooms of Henry Hope & Sons, Ltd., metal window makers, and their subsidiary, Hope's Heating & Lighting, Ltd., at 17, Berners Street, W. In both the boiler and air-conditioning rooms all the machinery is electrically driven. Two 0.9-h.p. totally enclosed Crompton "Minor" motors drive the Hope mechanical underfeed "Stokors," which fire the two boilers, one a low-pressure hot-water boiler, providing heating for the whole building with the exception of the showrooms and mezzanine

The boiler room at 17, Berners Street, W.

floor; the other a low-pressure steam boiler providing steam for the air-conditioning plant and domestic supplies through a calorifier. The Hope mechanical coal-handling plant for feeding the hoppers of the stoker is driven by a ¾-h.p. geared motor. The circulation of water in the heating system is accelerated by two "Super Selfix" pumps driven by two ¾-h.p. motors, one remaining as a standby. The Sturtevant centralised vacuum cleaning plant has a 0.9-h.p. motor drive. As the boiler room is below sewage level, a Holden & Brooke self-priming pump, automatically controlled by a ball float switch, and driven by a 1-h.p. "Minor" motor, is installed. A semi-rotary hand pump is available as a standby. The air-conditioning installation which provides conditioned air to the basement, mezzanine and ground floors, is fully automatic. The inset and extract fans are driven by 1½-h.p. and ¾-h.p. motors, respectively. All air is passed through a specially designed washer having numerous water sprays, the water being circulated by a centrifugal pump, driven by a 2-h.p. motor. The temperature of the water used for washing the air is automatically controlled, and for this purpose a "Freon" refrigerating plant is provided, this unit is driven by a 7½-h.p. motor. A ¼-h.p. motor drives a small air compressor which maintains an air pressure to operate the pneumatic automatic valves. The whole of the installation was designed and installed by Hope's Heating & Lighting, Ltd., and we are asked to state that any interested person can visit the premises during ordinary business hours, when facilities will be given for inspection of the plant.

Change of Name

The Young Accumulator Co. (1929), Ltd., has changed its name to the Young Accumulator Co., Ltd.

Fluorescent Lighting for a Ballroom

A highly successful lighting installation of fluorescent tubes has recently been carried out in the ballroom of the Grosvenor Hotel, Edinburgh. Twelve curved triple units of "Osira" fluorescent tubes, each 8 ft. 6 in. long, provide the main illumination for the ballroom, which is 50 ft. long by 27 ft. wide and 15 ft. high to the top of the barrelled ceiling, the walls being finished in gilt and the ceiling in matt salmon pink. The colour lighting combination employed utilises two gold tubes and one pink. This gives a light of warm quality that remains constant throughout life. Supplementary lighting comes from eight specially designed G.E.C. pendant fittings finished in matt silver, with white celastoid accordion-pleated cylinders, housing 20-in. architectural lamps. The erection work was carried out by Pratt Bros., while the wiring was installed by A. Taylor.

Dutch Lamp and Radio Exports

The returns of the Dutch Statistical Board show that the value of the exports of radio apparatus from Holland in the first six months of the year has been 19,383,000 fl., as compared with 52,640,000 fl. in the whole of 1937. The corresponding figures for tungsten lamps are 3,161,000 fl. and 7,375,000 fl.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price July 27th	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4¼d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... . per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94 to £99	£6 dec.
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£184	£5 inc.
Grade II ... ... ,,	£129	£2 inc.
Grade III ... ... ,,	£71	£2 dec.
c Brass (rolled metal 2" to 12" basis)... per lb.	8d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¼d.	—
c ,, Wire, basis ... ... ,,	8¾d.	¼d. inc.
c Copper Tubes (solid drawn) ... ,,	1/0¼d.	—
g ,, Bars (best selected) ... per ton	£76	£2 inc.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£47	£3 5s. inc.
d ,, ,, Wire Rods ... ,,	£51 15s.	£3 15s. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	—
f Ebonite Rod ¼" dia. & up.... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	7¼d.	¼d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£17	10s. inc.
g Mercury ... ... per bot.	£13 10s.	—
e Mica (in orignal cases) small ... per lb.	10d. to 2/-	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/- to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/0½d.	½d. inc.
p ,, ,, rolled strip & sheet ,,	10½d.	½d. inc.
p ,, ,, wire ... ... ,,	1/0½d.	½d. inc.
o Platinum ... ... per oz.	£7 5s. 0d.	12s. 6d. inc.
d Silicium Bronze Wire ... ... per lb.	8 ½d.	½d. inc.
g Spelter ... ... per ton	£14 3s. 9d.	11s. 3d. inc.
g Tin, Block (English) ... ... ,,	£194 10s.	£5 10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Orniston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Lighting an Irish Hospital

The new County Hospital at Monaghan, Eire, is very largely equipped with G.E.C. electrical material and is lighted throughout by "Osram" lamps. About 300 totally enclosed hospital lighting fittings with white enamelled metalwork have been installed for all general lighting purposes, a special type of unit being employed for the operating theatre. Outside the building the gate posts, columns and approach have also been illuminated. Pirelli-General cable was used for underground and internal wiring, over 17,000 yd. of the latter being employed, in addition to miles of flexible and bell wire for the luminous indicator system, telephones, &c. There are sixty luminous indicator units with sectional and master control, and numerous telephones and accessories. A radiogramophone and portable radio set are also installed. A special battery charging motor generator, switchboard and battery are installed for the luminous indicator and telephone systems, as well as for the emergency lighting circuits in the operating theatre. Other G.E.C. equipment includes all the main switchgear (comprising various special boards), conduit accessories, eighty interlocking switch-plugs, fifty-six special fuseboards and all the necessary switch boxes, switches, plates, accessories, &c. The installation work was carried out by the Castleblayney Electric Light & Power Co.

New Catalogues and Lists

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—An 80-page illustrated catalogue of ship wiring cables.

Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.—A brochure describing salient pole alternators and synchronous motors, type "NS."

British Aluminium Co., Ltd., Adelaide House, London, E.C.4.—An illustrated booklet called "Aluminium, a Metal of Infinite Versatility."

Mitchell Electric Co., Ltd., Meco Works, Wheeleys Lane, Five Ways, Birmingham, 15.—An illustrated catalogue of "Mitchell-Crescent" electric panel fires.

Normand Electrical Co., Ltd., North Street, Clapham Comman, London, S.W.4.—Details of a new type "SR" single reduction geared motor.

Metropolitan-Vickers Electrical Co., Ltd., 75-77, Margaret Street, London, W.1.—A comprehensive illustrated catalogue of electric discharge lamps.

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—Details of new 2- and 5-A plugs and sockets for B.S.S. boxes.

Superlamp, Ltd., 6, Paul Street, London, E.C.4.—Details of the company's appliances in connection with A.R.P.

London Aluminium Co., Ltd., Westwood Road, Witton, Birmingham, 6.—Leaflets describing "Diamond" kettles and a combined heater and cooker.

Phosphor Bronze Co., Ltd., 54, St. Thomas Street, London, S.E.1.—A catalogue of oil-retaining bronze bearings.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—A 55-page catalogue of ship wiring cables.

Reductions of Capital

The High Court has confirmed the reduction of the capital of the Brush Electrical Engineering Co., Ltd., from £600,000 to £233,604.

In the Chancery Division on Monday last Mr. Justice Simonds confirmed the reduction of the capital of the M-O Valve Co., Ltd., from £100,000 to £50,000. Counsel stated that the reduction was due to the company having £50,000 in excess of its needs and it was proposed to return that sum to the shareholders.

Winding-up Order

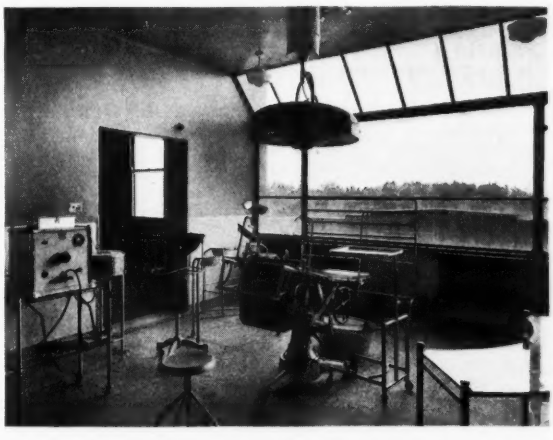
In the Companies' Court on July 18th Mr. Justice Simonds, on a creditor's petition, made an order in the usual form for the compulsory winding-up of Gambrell Radio Communications, Ltd., of Broomhill Road and St. James' Square, S.W.

Company Liquidations

Universal High Voltage Radio, Ltd., 12-13, Henrietta Street, Covent Garden, W.C.2.—A meeting of creditors was held on July 22nd when a statement of affairs was submitted showing liabilities of £5,111, of which £549 was due to the trade. Assets totalled £430, from which had to be deducted £150 for preferential claims, leaving net assets of £280, or a deficiency as regarded the unsecured creditors of £4,831. The issued share capital of the company was £2,464 and the total deficiency as far as contributories were concerned was £7,295. The directors attributed the recent decline in turnover to the company's inability to complete sets and fulfil orders already placed, and sets for stock, owing to non-delivery of the main component parts by their suppliers. While the company was seeking a new source of supply the main season was lost and the turnover decreased. The company brought an action against their former suppliers, which action resulted in judgment against them, and involved them in costs amounting to £1,750. The voluntary liquidation of the company was confirmed, with Mr. Percy Phillips as liquidator.

Gullick & Lock, Ltd., electrical and radio engineers, 22, West Street, Epsom.—The first meetings of creditors and shareholders were held on July 21st at Carey Street, W.C., under a winding-up order made on June 20th. The statement of affairs showed liabilities of £2,342, against assets estimated to realise £1,929. The failure of the company was attributed to the fact that estimated profits on electrical contracts were not realised, partly owing to the excessive rise in the cost of raw materials last summer, but the Official Receiver felt that the failure was undoubtedly due to general mismanagement on the part of the directors. A resolution was passed in favour of the appointment of Mr. Charles Latham as liquidator, with a committee of inspection.

E. H. Maisner & Co., Ltd., 16, Coleman Street, E.C., and 492 and 494, New Cross Road, S.E.—Meetings of the creditors and shareholders under the compulsory liquidation were held on July 20th at Carey Street, W.C. Mr. H. P. Naunton, Senior Assistant Official Receiver, reported that the company was formed in 1923 as dealers in electrical goods imported principally from Germany. In 1933 the business was discontinued, owing to the introduction of tariffs, and in July, 1936, the company commenced to deal in wireless accessories, &c., under the style of "Masons Stores." The failure was attributed to depression in trade caused through the fact that the business was situated in a very poor district and that the profits were insufficient to cover overhead expenses; also to bad debts and overdrawings by the late Mr. Maisner. The liquidation accounts showed liabilities of £6,429, and in the absence of assets the liquidation was left in the hands of the Official Receiver.



The operating theatre at the County Hospital, Monaghan

Light & Power Contractors (Liverpool), Ltd., Liverpool.—At the meeting of creditors the statement of affairs disclosed liabilities of £2,995 and assets of £3,133, estimated to realise £939. After allowing £85 for preferential claims the net assets were £854, leaving a deficiency, as regarded the creditors, of £2,142. The issued capital was £1,000, and so far as the shareholders were concerned there was a deficiency of £3,142. It was decided that the voluntary liquidation should be continued with Mr. W. Lodge as liquidator. A committee was also appointed.

Yeovil Electric Light & Power Co., Ltd.; Tisbury Electric Supply Co., Ltd.; Lymington Electric & Power Co., Ltd.; and **Thames Valley Electric Supply Co., Ltd.**—Winding-up voluntarily. Particulars of claims to the liquidator, Mr. E. J. Harrison, 11, Waterloo Place, S.W.1, by August 26th.

Coates & Co. (Harrogate), Ltd.—Meetings, August 31st, at 11, Princes Square, Harrogate, to receive an account of the winding-up by the liquidator, Mr. S. T. Milner.

Ashton Electrical Co. (Preston), Ltd.—Particulars of claims by July 30th to the liquidators, Messrs. F. E. Bendall and A. E. Attwood, c/o Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.2.

Yorkshire Waste Heat Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. J. W. Chant, 36, Park Place, Leeds.

Bankruptcy Proceedings

W. H. McMillan, radio dealer, 21, Allport Lane, Bromborough, Cheshire.—The public examination was closed recently at the Court House, Pilgrim Street, Birkenhead. At the previous hearing it was reported that there were unsecured liabilities of £1,077, and estimated net assets of £332, leaving a deficiency of £745.

W. B. Smithers, electrical contractor, lately of 11, Oakwood Close, Dartford.—Receiving order made July 14th on debtor's own petition. First meeting to-day (Friday) at the Official Receiver's Office, 280a, High Street, Rochester. Public examination August 8th at the Court House, Eastgate, Rochester.

A. Ll. Rothery (trading with A. C. Dobbing as "The Ripon Electrical Co."), electrical engineers, 39, Kirkgate, Ripon (separate application).—Discharge granted June 24th, subject to debtor's consenting to judgment being entered against him by the Official Receiver for £96 4s.

R. Corbett and **I. A. J. Merritt** ("Corbett & Merritt"), electrical and radio engineers, 2b, Junction Road, Andover.—Last day for receiving proofs for dividend August 5th. Trustee, Mr. H. J. Jones, Official Receiver, 12, Rolleston Street, Salisbury.

H. W. Martin ("Nitram Radio" and "H.M. Radio Stores"), radio dealer, lately carrying on business at 2, The Arcade, High Street, Ponders End, and 15, Station Road, Chingford.—Receiving order made July 15th on a creditor's petition.

Elizabeth Nelson ("E. Nelson & Son"), electrician, 63, Wharton Street, South Shields.—First and final dividend of 1s. 1½d., payable at the Official Receiver's Office, 31, St. Mary's Place, Newcastle-on-Tyne.

H. A. Simpson and **Eva Dyson** ("Simpsons"), radio and electrical engineers, 18, Eastbank Street, Southport.—Second and final dividend of 3d. in the £ payable August 5th at 413, Lord Street, Southport.

W. C. Hanson (Kenilworth Radio Supplies), 78, Priory Road, Kenilworth, lately trading at 37, Warwick Road, Kenilworth.—Application for discharge to be heard on September 23rd at the Shire Hall, Warwick.

W. W. Webber, radio and gramophone dealer, Woodville Street, Castle Cary, Somerset.—First and final dividend of 10½d. in the £, payable at the Official Receiver's Office, 12, Rolleston Street, Salisbury.

J. A. Whiteman ("Northfield Radio"), lately radio dealer, 4, Northfields, Kilburn, Derby.—Receiving order made July 15th on debtor's own petition.

Vera F. Smith ("R.W. Products"), manufacturer of radio aerials, 12, High Street, Old Woking.—First and final dividend of 6s. 2d. in the £, payable at 4, Charterhouse Square, E.C.1.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—AUTHORITY TO CARRY OUT FLOODLIGHTING SCHEMES.—Among new powers granted to the Corporation by a Parliamentary Commission which has been inquiring into a Provisional Order promoted by the Town Council is that of carrying out illumination and floodlighting schemes.

Aberystwyth.—SUPPLY EXTENSION.—When the Electricity Department recently canvassed the Llanbadarn and Waun Fawr areas 250 householders were interviewed and 145 signed a request form for a supply. It is intended to proceed by way of a Fringe Order.

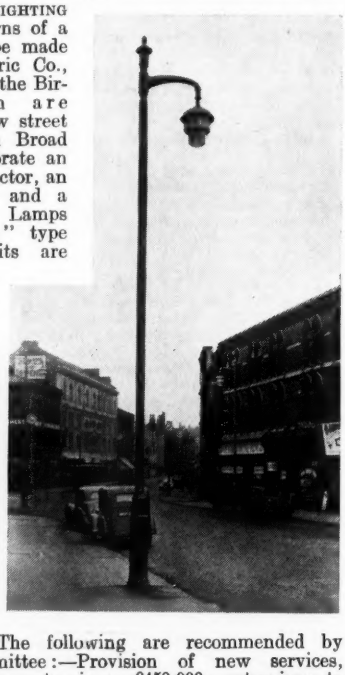
Addington.—ELECTRICITY FOR ESTATE.—The County of London Electric Supply Co., Ltd., is to extend its mains to the Spring Park Farm estate at a cost of £691.

Beccles.—ELECTRIC MOTOR REPLACES GAS ENGINE.—A 7½-h.p. electric motor and pump are to be installed at the sewage works by the Town Council to replace the existing gas engine which has been in service since 1905.

Bedford.—A.R.P. SCHEME.—The Electricity Committee has considered an A.R.P. scheme prepared by the borough electrical engineer in connection with the electricity undertaking and has given its provisional approval. The estimated capital expenditure amounts to £7,275, including £2,400 for constructional work at the generating station, sub-stations and depôt and £2,750 for electrical equipment spares.

EXTENSION TO ESTATE.—The Electricity Committee is to extend the mains at a cost of £3,158 to the Biddenham estate.

Birmingham.—RE-LIGHTING BROAD STREET.—Lanterns of a special ornamental type made by the General Electric Co., Ltd., to the designs of the Birmingham Corporation are being used for the new street lighting installation in Broad Street. They incorporate an inner symmetrical refractor, an outer bowl refractor, and a special type of canopy. Lamps of the 500-W "Osram" type are used. The units are arranged at a mounting height of 25 ft. with a projection of 3 ft. 6 in. over the roadway. The average spacing is of the order of 123 ft., the fluted columns (of special design purchased direct by the Corporation) being arranged in pairs on opposite kerbs. The lighting is Class C.



New G.E.C. ornamental street-lighting lanterns, Broad Street, Birmingham

PROPOSED WORKS.—The following are recommended by the Electricity Committee:—Provision of new services, £200,000; general mains extensions, £450,000; extensions to Hams Hall "B" building and cooling tower, £197,873; generating and boiler plant, £417,000; switchgear and general electrical works, £153,607; and purchase of freehold land and buildings at Dale End, £75,000.

RADIOLOGICAL EQUIPMENT.—The Health Committee is to provide radiological equipment costing £8,030 at various institutions.

Blaydon-on-Tyne.—OVERHEAD LINE.—The North-Eastern Electric Supply Co., Ltd., is to erect an overhead line to the Normans Riding Hospital and to Burnhills Quarry, Winlaton.

Brighton.—COUNCIL MAY SEEK GREATER POWERS.—The draft proposals of a proposed new General Powers Bill which have been confirmed by the Town Council include provision for inflicting penalties where false coins are placed in electricity meters. Other powers that may be sought include the making of by-laws applicable to trolley-buses run by the Brighton and Hove Omnibus Co., and authority to alter, add to or rebuild Volk's Railway when this is taken over by the Corporation. The Bill will not be proceeded with before 1939-40.

Colne Valley.—DOMESTIC TARIFF REDUCTION.—The Electricity Committee has decided to reduce the domestic two-part tariff running charge from ¾d. per kWh. for the first 320 kWh per quarter and ½d. thereafter to ¾d. per kWh for the first 240 kWh and ½d. thereafter. The additional charge of 6d. per week which is levied in certain districts is to be discontinued.

Consett.—ELECTRIC LIGHTING.—The Urban District Council has approved a scheme for installing electric lighting in 765 houses. Plans are by Mr. T. Hutton, surveyor, Blackhill.

Coventry.—POWER STATION EXTENSIONS.—The Electricity Committee is seeking sanction to borrow £357,000 for extensions at the Longford power station.

Darlington.—LOW FLAT RATE.—The Electricity Committee recommends the fixing of a flat rate of 1¾d. per kWh for electricity for lighting all the year round.

Dartford.—BATTERY CHARGING TARIFF.—The Electricity Committee recommends a rate of ¾d. per kWh for charging electric vehicle accumulators.

Dartmouth.—SUPPLY TO FARMS.—Consent has been given by the Town Council to a proposal by the Torquay Electricity Department to supply electricity to Little Dartmouth farms.

Dorchester.—ELECTRICITY CHEAPER.—It is recommended by the Electricity Committee that the lighting flat rate shall be reduced by ½d. and the shops and offices two-part tariff by ¼d. per kWh.

Dover.—UNDERTAKING'S PROGRESS.—Although the Council was apprehensive of the financial effect of the institution last October of a domestic two-part tariff, the annual report of Mr. R. G. Widgery, the new borough electrical engineer, shows that the tariff has fully justified itself. Up to the end of March 827 consumers had adopted the tariff and consumed 888,486 kWh, which was substantially more than the flat-rate decrease occasioned by the transfers. Although the Department was deprived of the tramways load due to the substitution of buses and another large consumer was lost, the total sales increased by 9 per cent. to 6.9 million kWh. Cooking demonstrations at the showrooms continued to prove popular, and there was a large increase in apparatus hired out as the advance of nearly 29 per cent. in domestic power and heating supplies indicates.

Dumfries.—FINANCIAL POSITION OF UNDERTAKING.—Referring to the electricity undertaking at a recent meeting of Dumfries County Council, Colonel Crabbe said it had been hoped that it would have been firmly established and able to meet all its loan charges, but owing to the rise in coal prices no loan charges could be paid on the high voltage services this year. These would have to be met in 1939-40, however, and unless extensive new construction which did not produce adequate revenue could be curtailed, it seemed probable that the debit balance would fall on the rates.

Exeter.—REQUESTS FOR SUPPLY.—Application for a supply of electricity from Exeter has been made by seventy residents at Shillingford and Dunchideve. The capital cost of overhead lines and equipment would be about £2,600, and a meeting is to be held to ascertain what guarantees can be obtained.

Falkirk.—SUPPORT FOR POPLAR RESOLUTION.—The Town Council is to support a resolution dealing with electricity supply put forward by the Poplar Town Council. The resolution declares that there is already sufficient control over the industry vested in the Electricity Commissioners and that any attempt to create a further overriding authority would be a check on local initiative and a barrier to the progress of the industry.

France.—LARGE HYDRO-ELECTRIC SCHEME.—Monsieur Frossard, Minister of Public Works, and Monsieur Queuille, Minister of Agriculture, recently inspected the preliminary work on the Aigle barrage. This work is the first stage in the construction of a hydro-electric power station on the Dordogne, intended to be one of the biggest in France, reports *Reuter's Trade Service* from Paris.

Germany.—NEW USE FOR SODIUM VAPOUR LAMPS.—The Siemens-Schuckert Works Co., Berlin, has recently adapted sodium vapour electric discharge lamps to the illumination of road direction signs at night. It is stated that experiments with the new lamps have shown that their yellow light renders the black lettering on a yellow background clearly readable at a considerable distance.

Godmanchester.—OVERHEAD LINES.—On the grounds that if underground cables were stipulated the supply would be made too dear for poor people the Town Council has agreed to the erection of overhead lines in Earning Street and Cambridge Road.

Hoylake.—FIRE PRECAUTIONS.—The Council is making application for sanction to borrow the sum of £2,100 in connection with fire precautions at the electricity works.

Hull.—CAPITAL WORKS.—The Central Electricity Board has indicated that, apart from the provision of a new boiler, it is not likely to require additional plant at Hull during the next five years. It is not anticipated that any heavy expenditure will be incurred on the proposed new power station at Hessle in that period.

India.—VALUE OF ELECTRICAL DEVELOPMENT.—In a paper which he read before the East India Association in London last week, Sir William Stampe, late chief engineer of the United Provinces Irrigation Department, discussed electrical development under the new Constitution. He said that there was little limit to the economic effect which the introduction of cheap power into an area could produce if boldly and wisely handled. Such great schemes as the Ganges Canal grid had opened up possibilities of employment for educated Indian youth, but efficient technical training was essential.

Jarrow-on-Tyne.—SODIUM LIGHTING.—The North-Eastern Electric Supply Co., Ltd., is to provide thirty-nine sodium street lamps in York Avenue at a cost of £1,332.

Leicester.—ALLOCATION OF ELECTRICITY PROFIT.—An amendment to allocate the £74,774 surplus on the year's working of

the electricity undertaking to the relief of the rates was recently defeated by the Town Council after a long debate, two members supporting it.

London.—ELECTRICITY SUPPLY TO OUTFALL WORKS.—The Main Drainage Committee of the London County Council reports that the two generators installed at the southern outfall works in 1933, following failure to obtain an electricity supply on satisfactory terms from the Erith Council, are now inadequate. Further negotiations have accordingly been entered into with the Erith Council for supplementing the works supply and enabling the tenants of the works cottages to have electric cookers. The Erith undertaking is willing to provide a duplicate high-voltage supply to a sub-station at the outfall works without cost to the County Council, and also at its own expense install the sub-station plant for and run cables to the cottages. It is proposed that the County Council shall pay the hire charges for the electric cookers.

SLUDGE SCRAPERS.—The London County Council recommends the provision of eight additional electrically operated rotary sludge scrapers at the northern outfall works at a cost of £27,782.

CABLE RENEWAL.—The cable which carries the main lighting supply for the north side of Woolwich Tunnel has been in service for about twenty-seven years and has broken down. Temporary measures have been taken to maintain full lighting, but it is considered that the only satisfactory method of dealing with the trouble is to install a new cable over the entire length. In view of the urgency of the matter an order for the new cable has been placed by the London County Council. The estimated cost of the supply and laying of the new cable and the examination of the existing cable conveying power for driving the north lift, which may also be defective, is £550.

REWIRING INSTALLATIONS.—The L.C.C. is to renew the electrical installations at the Fountain and Bec hospitals at a cost of £12,625.

ELECTRICITY FOR PUMPING.—The Metropolitan Water Board is to install an electrically driven booster at the Cricklewood pumping station at a cost of £2,500.

LIGHTING INSTALLATION.—The City of London Corporation is to install electric lighting at the London and Rogers' Almshouses, Brixton, at an estimated cost of £660.

STEPNEY.—A quotation of £2,700 by the Franki Compressed Pile Co. for work in connection with the piling and foundations for the 30,000-kW turbo-alternator to be erected at the Limehouse generating station has been accepted. At the end of last year the Council accepted a tender for equipment for the installation of a belt coal conveying plant, together with a drag scraper, in connection with the existing and additional coal store at the generating station. It is now proposed to proceed with the foundations, structural alterations, machine house hopper and concrete wall for the additional store, and the tender of the Franki Co. (£3,580) is recommended for acceptance.

Malaya.—ELECTRICAL POSITION.—In the four Federated Malay States the total output of electricity during 1937 by the Government Electrical Department and companies was 521.0 million kWh as compared with 446.8 and 298.0 million kWh in 1936 and 1935 respectively. Explaining the lower rate of increase last year Mr. H. R. Sparrow, M.I.E.E., Adviser on Electricity to the Government, states that owing to the limited capacity of the Government generating plants in Selangor many applications from local tin mining and other industrial concerns had to be refused, and the deficiency made good by the adoption by those concerns of oil engines for motive power. Adequate measures are, however, being taken to meet future supply demands. The Bungsar power station, Kuala Lumpur, is to have its generating plant capacity increased by 12,500 kW, and other extensions are to be carried out elsewhere. It is stated that there are great industrial possibilities in the Klang and Port Swettenham areas and that it only remains to provide an adequate supply of electricity. The Adviser mentions that steps are being taken to educate the public in the advantages to be obtained from better lighting, and that recent demonstrations in all phases of cooking by means of electricity have resulted in an unprecedented demand for electric cookers.

Melksham (Wilts).—ELECTRIC DRIVE FOR WATERWORKS.—The Trowbridge, Melksham and District Water Board is to introduce modern electrical machinery to drive the works at Upton Scudamore, replacing the existing oil engine.

Northern Ireland.—GENERATION OF ELECTRICITY.—A Ministry of Commerce return shows that 52.7 million kWh was generated by authorised undertakings in Northern Ireland during the quarter ended June 30th last, as compared with 49.8 million kWh in the corresponding quarter of 1937, representing an increase of 2.9 million kWh, or 5.8 per cent. The total number of kWh generated during the first six months of 1938 was 120.7 million, compared with 114.4 million for the corresponding period of 1937, an increase of 6.3 million kWh, or 5.5 per cent.

Paisley.—COOKERS ON HIRE.—The Electricity Advisory Committee has approved the principle that cookers let on hire should become the property of the hirer at the end of a period of years.

TESTING EQUIPMENT.—Sanction has been given by the Electricity Advisory Committee to the purchase of testing equipment costing £1,055.

Poland.—LOAN FOR ELECTRICAL WORK.—Polish newspapers state that an English loan of £5,000,000 will be granted to Poland in the autumn for continuing the work of electrification in that country, including the conversion of more railways from steam to electrical operation and the establishment of a long transmission line.

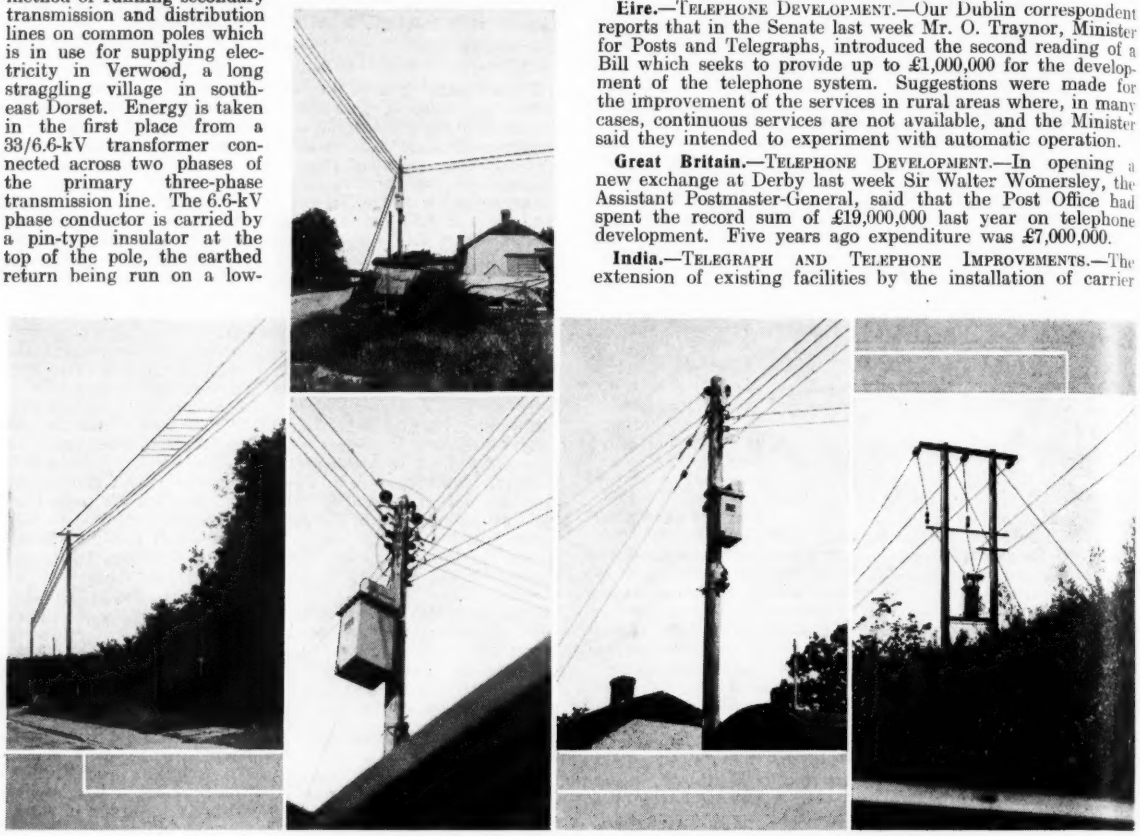
Portsmouth.—EXTENSIONS INAUGURATED.—As we mentioned in our last issue in describing the new plant, the extensions to the Gunwharf Road station were inaugurated by the Lady Mayoress on July 21st. A gathering at the Guildhall followed the ceremony at which the Lord Mayor (Councillor F. J. Spickernell), who presided, paid a tribute to the great amount of work which Mr. B. Handley, the city electrical engineer, and his staff had put in. In the course of his response, Mr. Handley said that a great deal of credit was due to his assistants, Messrs. Weir and Hoare. He quoted some figures to show the magnitude of the addition, and referred to the negotiations with the Central Electricity Board which is responsible for the operation of the station as a "selected" one. Mr. J. L. Wilson (B.T.H. Co.), on behalf of the contractors, presented the Lady Mayoress with a silver rose bowl, and made reference to the happy relations existing between the contractors and Mr. Handley. After Mrs. Spickernell had replied, Mr. W. Q. Henriques (Clarke, Chapman & Co.) made a presentation to Mrs. Lewis, wife of the chairman of the Electricity Committee, who expressed her thanks and urged the women present to make greater use of the city's electricity supply. Alderman W. J. Lewis, who also spoke, emphasised the fact that Mr. Handley had carried through the work himself without the aid of a consulting engineer. In the evening there was a dinner at the Guildhall at which the Lord Mayor again presided, and responded to the toast of his health, proposed by Mr. E. R. Wilkinson, commercial manager of the Central Board. The other toasts were "Success to the Electricity Undertaking," proposed by Mr. H. Nimmo, chief engineering inspector to the Electricity Commission, and replied to by Alderman Lewis; and "The Contractors," proposed by Mr. Handley with responses by Messrs. J. L. Wilson and W. Q. Henriques. Before the toasts two excellent films produced by local amateurs were shown.

Shipley.—STREET LIGHTING SCHEME.—Last week the Urban District Council approved a scheme prepared by the electrical engineer for the improvement of the lighting in the Bradford-Keighley road. Mercury electric-discharge lamps will be installed at an initial cost of £2,230 and an annual maintenance cost of £1,234.

Southend-on-Sea.—DOMESTIC DEVELOPMENT.—Of the 65.8 million kWh sold by the Electricity Department last year power supplies (excluding traction) accounted for only 6.2 million kWh. The principal outlet was residential supplies, which totalled 37.1 million kWh, having increased during the year by 4.9 million kWh (15 per cent.) compared with the overall advance of 6.4 million kWh (11 per cent.). Naturally, the Department has been more seriously affected by the increase in the cost of fuel than undertakings selling a large part of their output under agreements containing coal clauses. Moreover, the number of vacant premises connected to the mains—9.2 per cent. of the total—has aggravated the problem. In the past year the number of connections to the mains increased by 1,706, but the total of 42,204 included 3,937 vacant premises. Nevertheless, Mr. A. C. Johnson, the borough electrical engineer and manager, is opposed to any general increase in tariffs, which he considers would impede progress, but it is proposed that certain domestic consumers who are enjoying particularly favourable terms should be charged on the same basis as new consumers. The increased income from this change is estimated at £1,500 in a full year. A table of connections of domestic apparatus hired out or sold for cash or on hire-purchase terms in the engineer's report gives the total electric cookers as 5,153, an increase of 634 during the past year. Unusually high water-heating development again marked the Department's operations, the net increase in apparatus connected being 3,088 to a total of 14,140. Other totals, with increases in parentheses, were as follows:—Fires, 3,819 (510); wash-boilers, 1,711 (31); vacuum cleaners, 1,428 (1,194); kettles, 843 (357); irons, 549 (239); refrigerators, 408 (100); toasters, 68 (23); washing machines, 52 (31); and breakfast cookers, 28 (5). An interesting point with regard to electric cookers is that these are being converted to thermostatic control whenever they are returned to the stores. At March 31st last 2,092 out of the total of 5,153 were fitted with automatic temperature control. The Department's fleet of vehicles includes seven electric vans, the cost of electricity for which, at 0.25d. per kWh, works out at 0.17d. per mile, and one electrically operated tower wagon.

United States.—GOVERNMENT'S POWER PROJECTS.—The Secretary of the Interior has announced the first series of allotments under the programme of the Public Works Administration for power projects, which, if constructed, will compete with private utility companies, states a *Reuter* message from Washington. The allotments include loans and grants totalling £1,900,000 for twenty-one projects, the aggregate construction costs of which would be £3,034,400. The projects will be subject to the terms of the Government's power policy announced by Mr. Ickes on July 8th. He said the Government would not compete with private utilities except in cases in which it was impossible to purchase existing private facilities "on reasonable terms and conditions."

Verwood (Dorset).—COMMON POLES FOR HIGH AND LOW VOLTAGE LINES.—The accompanying photographs illustrate a method of running secondary transmission and distribution lines on common poles which is in use for supplying electricity in Verwood, a long straggling village in south-east Dorset. Energy is taken in the first place from a 33/6.6-kV transformer connected across two phases of the primary three-phase transmission line. The 6.6-kV phase conductor is carried by a pin-type insulator at the top of the pole, the earthed return being run on a low-voltage type of insulator below it at the side of the pole. Below again are the 460-230-V single-phase three-wire bare distributors. These are fed from 25-kVA single-phase transformers spaced at intervals, the primary side of which is connected through a fuse to the 6.6-kV single-phase system.



Top: Single-phase pole terminal at west end of Verwood, Dorset. Left to right: (1) Guard underneath 6.6-kV line for telephone wire crossing. (2) Transformer on pole in middle of village; 6.6-kV phase wire at top with single-phase fuse, down run to transformer in cable. (3) Terminal pole of 6.6-kV line at west end of village; single-phase fuse at top of pole on right. (4) 6.6-kV line; guard underneath for road crossing coming off right-hand pole

Traction

Blackpool.—FUTURE OF THE TRAMS.—There are indications that in the not far distant future the Corporation may dispense with its trams except on the Promenade route to Bispham. The question came under review at a committee meeting recently, when tenders for the relaying of the tram track in Lytham Road were considered, and there was a proposal to discontinue the trams. The matter was referred to the Transport Committee for consideration and report.

Halifax.—DISCONTINUANCE OF TRAMWAYS RECOMMENDED.—The Passenger Transport Committee has decided to ask the Town Council to abandon the rest of the tramways at the earliest convenient date. Buses will be used for transport on the routes affected by the recommendation of the committee.

L.N.E.R.—SUPPLY FOR SHEFFIELD-MANCHESTER LINE.—Both the Sheffield and Manchester Corporations, as well as the Yorkshire Electric Power Co., will supply electricity to the electrified Sheffield-Manchester line of the L.N.E.R., work upon which is now in hand.

South Shields.—TROLLEY-BUS ROUTE.—A Ministry of Transport inspector has examined the Council's proposed trolley-bus route from Laygate *via* the Pier Head along the Coast Road to Marsden Bay. The service is being put into operation immediately.

United States.—TROLLEY-BUSES.—Recently the Boston Elevated Railway inaugurated what is probably the first instance in the country of trolley-bus operation through a subway, states *Mass Transportation*. Owing to one of the platforms in the subway being on the left-hand side of the vehicles it has been necessary to provide trolley-buses having an extra door. The People's Railway of Dayton, Ohio, is to enlarge its fleet of trolley-buses by purchasing ten additional vehicles, and the Columbus and Southern Ohio Co. will have a fleet of seventy-eight trolley-buses when forty on order have been received.

NEW LOCOMOTIVES.—The American General Electric Co. and the Westinghouse Electric & Manufacturing Co. have both been awarded contracts amounting to $1,700,000 for electrical equipment for ten new passenger locomotives belonging to the Pennsylvania Railroad Co.—*Reuter*.

Communications

Eire.—TELEPHONE DEVELOPMENT.—Our Dublin correspondent reports that in the Senate last week Mr. O. Traynor, Minister for Posts and Telegraphs, introduced the second reading of a Bill which seeks to provide up to £1,000,000 for the development of the telephone system. Suggestions were made for the improvement of the services in rural areas where, in many cases, continuous services are not available, and the Minister said they intended to experiment with automatic operation.

Great Britain.—TELEPHONE DEVELOPMENT.—In opening a new exchange at Derby last week Sir Walter Womersley, the Assistant Postmaster-General, said that the Post Office had spent the record sum of £19,000,000 last year on telephone development. Five years ago expenditure was £7,000,000.

India.—TELEGRAPH AND TELEPHONE IMPROVEMENTS.—The extension of existing facilities by the installation of carrier apparatus enabling up to six messages by telephone and telegraph to be transmitted simultaneously between Calcutta and Delhi on the one hand and between Bombay and Karachi on the other is the most important project on which the Posts and Telegraphs Department is concentrating at present. The order for the necessary equipment has already been placed.

Italy.—MANY NEW RADIO TRANSMITTERS.—Signor Mussolini has approved plans for constructing twenty-one new radio transmitters in Italy. This will raise the number of Italian transmitters to fifty, including those of Tripoli (North Africa) and Addis Ababa (Abyssinia). It is stated that the number of licence holders in Italy will soon reach one million. Plans are being studied for the opening of a television service. The new transmitters will be at Florence, Turin, Bologna, Verona, Padua, Venice, San Remo, La Spezia, Macerata, Ascoli Piceno, Teramo, Aquila, Pascara, Foggia, Benevento, Campobasso, Taranto, Potenza, Cosenza, Catanzaro, Cagliari. —*Reuter* (Rome).

Malaya.—NEW TRANSMITTER.—The new short-wave transmitter of the British Malaya Broadcasting Corporation was formerly inaugurated by the Governor of the Straits Settlements, Sir Shenton Thomas, last week. The transmitter operates on a wavelength of 30.96 metres (frequency 9.69 megacycles), and experimental transmissions have been picked up successfully throughout Malaya and Java, and even in New Zealand. Sir Shenton Thomas said that the Corporation was not receiving any remuneration from the Government for the new service.—*Reuter* (Singapore).

Norway.—MINIATURE TRANSMITTERS FOR WHALING EXPEDITIONS.—Mr. H. W. Olsen, first wireless officer of the Norwegian *Kosmos* whaling expedition, has designed a miniature type of ultra-short wave transmitter which, enclosed with the necessary batteries in a watertight box, is mounted at the upper end of a flag harpoon employed to mark the position of a dead whale. The small transmitter automatically radiates a permanent signal for a sufficiently long time to enable the returning whale-catcher to locate the dead whale by means of d.f. apparatus. The new invention has been successfully tried out. The cost of building a number of such transmitters is extremely small compared with the losses of whales sustained by expeditions owing to bad visibility.

Sweden.—TELEPHONE CABLE TO FINLAND.—Telephone communication between Sweden and Finland will in the very near future be considerably improved, states *Reuter's Trade Service* from Stockholm. A second cable has just been laid in the sea between Sweden and the Aaland Islands, and the other half of the cable on the Finnish side will soon be connected.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aldershot.—August 2nd. Borough Council. Wiring of the laundry block in course of erection at the Isolation Hospital, Cemetery Road. (July 15th.)

Argentina.—September 20th. Buenos Aires Western Railway, Ltd. Rectifier equipments for traction sub-station. (See this issue.)

Australia.—MELBOURNE.—August 8th. City Council. Three-phase transformers. (T.Y. 24257/38.)*
September 6th. State Electricity Commission. 22-kV outdoor switchgear and accessories. (T.Y. 24850/38.)*
August 16th. Posts and Telegraph Department. Telephone relay sets. (T. 24830/1938.)*
BRISBANE.—September 20th. City Electric Light Co. 44-kV and 11-kV switchgear. (T. 24209/38.)*
VICTORIA.—August 30th. State Electricity Commission. Voltage regulating equipments. (T.Y. 24462/38.)*

Birmingham.—August 11th. Electric Supply Department. Electric cooker control units for twelve months. (July 15th.)
August 22nd. Railway sidings, including embankments, concrete bridges, river diversion and roads at the Hams Hall "B" power station. (July 22nd.)
October 3rd. Public Health and Maternity and Child Welfare Committee. General electrical engineering and engineering services and boiler plant in connection with extensions at Selly Oak Hospital and Infirmary. (See this issue.)

Bletchley.—August 2nd. U.D.C. One electrically driven deep-well pump and surface booster pumps for the Sandhouse Waterworks. A. Bates, engineer, Council Offices (deposit £2 2s.).

Dublin.—September 23rd. Commissioners of Public Works in Ireland. Field lighting equipment for the Dublin Airport, Collinstown. (July 15th.)
August 26th. Electricity Supply Board. Circuit-breakers, isolating switches and compressed air operating equipments and instrument transformers. (July 15th.)

Dundee.—August 10th. Electricity Department. Three-core, h.v. and multi-core, l.v., p.i., lead-covered cables. (July 22nd.)

Gainsborough.—August 13th. U.D.C. 6.6-kV metal-clad switchgear. (July 5th.)

Haslingden.—August 22nd. Town Council. Electrical work in connection with the erection of a gymnasium, nursery classroom and assembly hall. (See this issue.)

India.—SIMLA. August 6th. Indian Stores Department. Electric lamps for twelve months. (T. 24233/1938.)*
September 6th. Electricity meters for twelve months. (T. 24802/38.)*

Kirkcaldy (FIFE).—August 4th. Corporation. Electrical work at hall, Park Road housing estate. Town Clerk.

Leeds.—August 3rd. Corporation. Electrical installation at the new theatre suite, electrical and massage block at St. James's Hospital. Town Clerk, Room 57, Civic Hall (deposit £2 2s.).
August 10th. Aerodrome Committee. Electric lighting, heating, power, cooking and clock installations at the Leeds-Bradford Joint Municipal Airport, Yeadon, Yorkshire. (See this issue.)

London.—August 24th. Metropolitan Water Board. Pumping plant, &c., at the Hampton pumping station, Middlesex (July 15th.)
ISLINGTON.—September 16th. Borough Council. Three-phase e.h.v. switchgear. (See this issue.)

Manchester.—August 26th. Electricity Committee. 33-kV, three-phase, outdoor a.c. switchgear. (See this issue.)

Middlesex.—August 31st. County Council. Extensions to X-ray apparatus at the Central Middlesex County Hospital. (See this issue.)

New Zealand.—WELLINGTON.—September 28th. Posts and Telegraph Department. Seventy-five secondary cells. (T.Y. 24226/38.)*
September 29th. Porcelain or composition insulators and caps. (T. 24227/1938.)*
October 3rd. 1,000 trembler buzzers. (T.Y. 24294/1938.)*
September 27th. 5,500 condensers. (T.Y. 24225/38.)*
September 29th. 5,000 telephone coils. (24228/38.)*
August 30th. Public Works Department. Four 11-kV switches. (24288/1938.)*
August 16th. Eight battery-charging equipments. (T. 24820/1938.)*
November 1st. Remote control and metering equipment. (T. 24495/38.)* 50-kV outdoor steelwork and switchgear. (T.Y. 24300/1938.)*
November 8th. 10,000-kVA transformer bank for section 458 of the Mangahao scheme. (T. 24496/38.)*
November 15th. Indoor switchgear and control equipment for Waitaki power station. (T. 24497/38.)*
CHRISTCHURCH.—September 6th. Municipal Electricity Department. 11-kV sub-station switchgear and supervisory control equipment. (T.Y. 24293/38.)*
OTAGO.—November 30th. Harbour Board. One or two five-ton electric wharf cranes. (T. 24292/1938.)*

Northumberland.—County Council. Electrical installation at the Longbenton Dudley Junior Council School. County architect, County Hall, Newcastle-on-Tyne.

Peebleshire.—August 15th. Education Committee. Heating and electrical installation at new central school, Innerleithen. Reid & Forbes, 17, Great Stuart Street, Edinburgh.

Plymouth.—September 3rd. Corporation. Conversion of lifts to a.c. supply. (See this issue.)

Reigate.—August 31st. Borough Council. Street-lighting columns, brackets and lanterns with mercury-vapour discharge lamp control equipment. (See this issue.)

Shipley.—U.D.C. Lanterns, bracket arms, pole clamps, lamps, chokes, condensers, fuses, and cast-iron weatherproof boxes. H.v., d.c. testing equipment and oil filtration plant. (See this issue.)

South Africa.—PORT ELIZABETH.—August 25th. City Electrical Engineer's Department. Two 3,000-kVA transformers. (T. 24373/38.)*
August 25th. Five 10,000-kVA reactors, 440-yds. of 6,600-V cable and one h.v., d.c. testing and fault localising equipment.. (T. 24785/1938.)*
JOHANNESBURG.—August 17th. City Council, Eleven oil-immersed circuit-breakers. (T.Y. 24691/38.)*
August 24th. One electro dynamometer. (T. 24812/38.)*
PRETORIA.—September 1st. Union Tender and Supplies Board. Telephone apparatus. (T. 24816/38.)*

Southampton.—August 16th. Electricity Department. Conversion of lifts from d.c. to a.c. supply. (July 15th.)

Tottenham.—August 26th. Borough Council. Electrical stage lighting equipment for the Municipal Hall. (See this issue.)

Tredegar.—August 3rd. U.D.C. Electric cookers. (July 22nd.)

Uruguay.—MONTEVIDEO.—August 3rd. Electricity Supply and Telephones Administration. 30,900 metres of lead-covered conductors. (T.Y. 24170/38.)*
August 9th. 58,000 metres of h.v. and l.v. underground armoured cables. (T.Y. 24262/38.)*
September 15th. 290 electric reflectors and lamps. (T.Y. 24680/38.)*

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Acton.—Baths Committee. Accepted. Storage battery (£124).—D. P. Battery Co. Electrical work at baths (£62).—Page & Girling.

Birmingham.—Electricity Committee. Accepted. Turbo-alternator and condensing plant (£215,200).—C. A. Parsons & Co. Boiler (£148,000).—International Combustion. Switchgear (£92,101).—A. Reyrolle & Co.

Durham.—Education Committee. Accepted. Electrical installations: Boldon Colliery branch library.—Falconar Cross & Co. Stockton girls' junior instruction centre.—R. Robson.

Jarrow.—Town Council. Accepted. Electrical installation in 150 houses on the housing scheme (£1,403).—J. McCabe.

London.—HAMMERSMITH.—Town Hall Committee. Recommended. Electrical services in connection with the erection of the new Town Hall (£16,682).—Electrical Installations.
WESTMINSTER.—Highways Committee. Accepted. Electric warping capstan (£183).—Stothert & Pitt.
Recommended. Three electric motive units (£1,680) and one gully emptier on electric chassis (£827).—Electricars. Six batteries (£1,046).—Young Accumulator Co.
Wiring and fittings for the erection of distribution pillars at Queen Mary's Hospital for Children, Carshalton, Surrey:

	£		£
Leonard G. Tate and Co. Accepted	**728**	British Insulated Cables... ...	844
W. J. Furse and Co. (London) ...	792	Johnson and Phillips	848
W. T. Henley's Telegraph Works Co.	806	Malcolm and Allan (London) ...	891
Siemens Brothers and Co. ...	818	G. E. Taylor and Co.	1,134
Pirelli-General Cable Works ...	837	Read and Partners	1,189

Electrical installation in new nurses' home and new surgical ward block, &c., at St. Nicholas' Hospital, Plumstead:

	£		£
Pinching and Walton. Accepted	**4,306**	Duncan Watson (Electrical Engineers)...	4,850
Read and Partners	4,309	Berkeley Electrical Engineering Co.	4,912
Electrical Installations	4,352	Troughton and Young	4,995
Archibald Meckhonik	4,420	A. Hawkins and Sons	5,495
T. Clarke and Co.	4,420	Woolwich Borough Council Electricity Department	6,425
B. French...	4,752		
Buchanan and Curwen	4,815		

Electrical installation at the Anti-toxin Establishment, Woodmansterne Road, Carshalton, Surrey:

	£		£
Read and Partners. Accepted ...	**3,734**	Pinching and Walton	4,028
Atozed (London)...	3,751	A. Hawkins and Sons	4,175
T. Clarke and Co.	3,801	F. H. Wheeler and Co.	4,221
Samuel Reed and Sons	3,821	Archibald Meckhonik	4,350
Duncan Watson (Electrical Engineers)...	3,911	Troughton and Young	4,495
Electrical Installations	3,970	Buchanan and Curwen	4,610
Holliday and Son (Electrical) ...	4,025	Malcolm and Allan (London) ...	5,124
		W. J. Furse and Co. (London) ...	5,300

Wiring and fittings for electric lighting and domestic bells in pavilions, recreation hall, &c., at the Northern Hospital, Winchmore Hill:

	£		£
North Metropolitan Electric Power Supply Co. Accepted	**1,852**	Jacob, White & Co.	2,131
Read and Partners	2,009	Berkeley Electrical Engineering Co.	2,222
City Electrical Co.	2,039	Arthur Cozens	2,226
T. Clarke & Co.	2,080	Archibald Meckhonik	2,320
Duncan Watson (Electrical Engineers)...	2,083	F. H. Wheeler and Co.	2,357
William Steward & Co.	2,108	Samuel Reed and Sons	2,407
		Ilford Electrical Co.	3,259

Electrical installation in the new maternity block at St. Pancras Hospital II:

	£		£
Samuel Reed and Sons. Accepted	2,430	Berkeley Electrical Engineering Co.	2,900
Pinching and Walton	2,727	Alexander Hawkins and Sons ...	2,959
Troughton and Young	2,794	T. Clarke and Co....	3,105
Blackburn, Starling and Co. ...	2,844	Arthur Cozens	3,226
Duncan Watson (Electrical Engineers)...	2,866	Ellis and Ward	3,273
Francis Polden and Co.	2,888	Buchanan and Curwen	3,310

Wiring and fittings for electric lighting at Smithy Street School:

	£		£
G. Hopkins and Sons. Accepted...	803	Francis Polden and Co.	980
E. C. Sparkes and Co.	849	G. E. Taylor and Co.	1,009
F. Troy and Co.	873	Pemberton and Sturgess (Great Britain)...	1,046
Warren Smith and Co.	899	A. Gordemer and Sons	1,187
Alex. Hawkins and Sons... ...	927		
Read and Partners	970		

Wiring and fittings for electric lighting, &c., at Forest Hill Central Girls' School:

	£		£
E. and G. Champion. Accepted ...	1,042	Kirkdale Electrical Co.	1,238
Samuel Reed and Sons	1,087	J. L. Shadwell	1,239
Jones and Jennings	1,153	Leather and Strong	1,330
Jacob, White and Co.	1,155	Carr Brothers	1,393
Duncan Watson (Electrical Engineers)	1,170		

Electrical work at the County Secondary School, Dalston:

	£		£
Johnson and Tanner. Accepted...	1,826	F. W. Wheeler and Co.	2,204
Electrical Installations	1,962	Middlesex Electrical Co. ...	2,242
T. Clarke and Co....	2,054	Archibald Meckhonik	2,295
Berkeley Electrical Engineering Co.	2,134	Bower Engineering Works ...	2,350
		Ilford Electrical Co.	2,520

Hospital and Medical Services Committee. Electrical installation at the South Eastern Hospital, New Cross:

	£		£
Read and Partners. Accepted ...	9,055	Alexander Hawkins and Sons...	10,449
Troughton and Young	9,333	Malcolm and Allan (London) ...	10,454
Electrical Installations... ...	9,485	B. French	10,508
Holliday and Son (Electrical) ...	9,681	Buchanan and Curwen	10,783
Archibald Meckhonik	9,891	F. H. Wheeler and Co.	10,793
Samuel Reed and Sons	9,926	W. J. Furse and Co. (London)...	11,018
City Electrical Company ...	9,981	G. E. Taylor and Co.	11,374
Bower Engineering Works ...	10,293	Pinching and Walton	11,433
T. Clarke and Co.	10,345		

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cables for twelve months.—Metropolitan Electric Cable and Construction Co.; Standard Telephones & Cables. Electrical domestic apparatus for twelve months: Electric stoves.—Belling & Co.; Carron Company; English Electric Co.; G.E.C.; Hotpoint Electric Appliance Co.; Simplex Electric Co. Electric fires.—Belling & Co.; English Electric Co.; G.E.C.; Hotpoint Electric Appliance Co.; Simplex Electric Co. Electric washboilers.—Burco. Electric water heaters.—Bastian & Allen; English Electric Co.; G.E.C.; Johnson & Phillips; Raydex Electric Heaters; Simplex Electric Co.

METROPOLITAN WATER BOARD.—Accepted. Electric lamps for twelve months.—G.E.C.

STEPNEY.—Finance and Parliamentary Committee. Recommended. D.p. combined switch-fuses for twelve months (£594).—P. L. Dwyer & Co. Meter-testing equipment (£605).—Zenith Electric Co. Cable required in connection with the change-over of the Royal Mint electricity supply from d.c. to a.c. (£486).—Henley's.

Liverpool.—Electric Power and Lighting Committee. Recommended. Two control batteries for the Lodge Lane and Smithdown Road sub-stations (£413).—Tungstone Accumulator Co. Dismantling two 4,000-kVA transformers at Waterloo sub-station, and removal, overhaul and re-erection at Lodge Lane sub-station (£340).—English Electric Co.

Maidstone.—R.D.C. Accepted. Electrical installations in Council cottages: Nettlestead (£50).—James & Orpine. Yalding (£27).—Oswald Jones.

Manchester.—Electricity Committee. Accepted. Connecting cables for turbo-generator at Stuart Street power station.—Standard Telephones & Cables; Telegraph Construction & Maintenance Co.; Mersey Cable Works; Hackbridge Cable Co. One 50-kW mercury arc rectifier.—Hewittic Electric Co.

Education Committee. Accepted. Electrical works at schools: Domestic Economy.—A. E. Sudlow & Co. Cheetham.—S. H. Heywood & Co. Seymour Road.—A. Louden. Sytal cottage homes.—Broughton & Irlam Elecl. Eng. Co.

Housing Committee. Accepted. Electrical installations at 123 houses at Collyhurst and 40 houses at Levenshulme.—E. M. Evans & Son.

Central Purchasing Committee. Accepted. Electric lamps.—Stearn Electric Co.; Hirst Ibbetson & Taylor; Hobday Bros.; F. Hulme & Co.; Berry's Electric (1928); Falk, Stadelmann & Co.; S. Gratrix; Drake & Gorham Wholesale; Richard Johnson, Clapham & Morris; Underwood (Electric); Z. Electric Lamps and Supplies; Downes & Davies; Baxendale & Co.; Electrical Components; Brown Bros.; Sloan Electrical Co.; Wholesale Fittings Co.; Walsall Conduits; Simms Motor Units; J. C. White & Co.; E. Hammond & Co. (Auto Electric); John Ismay & Sons; Ensign Lamps.

Northampton.—Transport Committee. Accepted. Electrical installation at transport depot extension (£446).—Barnett & Soans.

High-vacuum Technique

A new publication (38 pp.) issued by W. Edwards & Co., Vaughan Rd., Loughborough Junction, S.E.5, is likely to be of use to anyone concerned in processes requiring high vacua, including drying and impregnating cables, coils and condensers and evacuating tubes, lamps and refrigerating units. Following a description of a range of Stokes pumps for various duties, is a discussion in simple language, illustrated by numerous curves, of the theory involved in building up and measuring high vacua and the operation and maintenance of vacuum systems.

Notes

Electric Cable Sheathings

The British Standards Institution has just issued a Specification for lead and lead alloys for the sheathing of electric cables (B.S.S. 801-1938) for use primarily in connection with the following British Standards: No. 7, "Dimensions of insulated annealed copper conductors for electric light and power." No. 480, "Dimensions of metal-sheathed paper-insulated plain annealed copper conductors for electricity supply." No. 608, "Dimensions of varnished cambric-insulated annealed copper conductors for electricity supply." No. 760, "Dimensions of metal-sheathed paper-insulated plain annealed copper conductors for use in mines." The preparation of the specification has been carried out by a committee consisting of Messrs. G. L. Bailey, chairman (British Non-Ferrous Metals Research Association); G. N. Beddoe (Admiralty); R. Genders, M.B.E. (War Office); G. Meikle (Air Ministry); C. E. Richards (General Post Office); J. Moseley Williams (Railway Companies of Great Britain); H. A. Tunstall, S. Beckinsale and T. R. Scott (Cable Makers' Association); Mr. R. W. L. Phillips (I.M.E.A.); H. C. Lancaster (Institute of Metals); B. Welbourn (I.E.E.); S. F. Dorey (Lloyds Register of Shipping); L. H. Daniels (E.R.A.); J. Turnbull (British Corporation Register of Shipping); and D. W. Jones (United Kingdom Lead Manufacturers' Association). The specification gives the composition of lead sheathing and of four lead-alloy sheathings and an appendix shows, for the information of users, the types of use for which the various sheathing metals are suitable. Other appendices give the method of carrying out a complete chemical analysis of lead sheathing (reproduced from B.S.S. 334 "Chemical Lead") and methods for the determination of alloying elements in the four alloys specified. Copies of the specification can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Fuel Consumption by Areas

From the report of the Electricity Commissioners styled "Generation of Electricity in Great Britain," an order of merit on the grounds of average fuel efficiency for steam stations in 1937, may be assigned to the ten regional areas into which the grid is divided. These results give only an approximation to overall thermal efficiency as particulars of the calorific value by areas are not available. The average fuel consumption per kWh sent out from all steam stations in the country (which produced 95.62 of the kWh generated from all sources) is given in the return as 1.51 lb. per kWh.

Area.	No. of Stations.	kWh. sent out (millions).	lb. fuel per kWh.
North-East England	20	1,318	1.36
South-East England	104	7,812	1.41
S.W. England and S. Wales	87	1,836	1.51
N.W. England and W. Wales	72	3,548	1.53
East England	8	200	1.55
Central Scotland	20	1,471	1.61
Mid-East England	36	2,450	1.61
North of Scotland	32	85	1.67
Central England	36	3,277	1.71
South Scotland	9	15	2.26

New Zealand Centennial Exhibition

The United Kingdom Government is to participate officially in the New Zealand Centennial Exhibition to be held at Wellington from November, 1939, to April, 1940. The year 1940 will mark the completion of one hundred years of British sovereignty and organised settlement in New Zealand, and the general theme of the exhibition will be the growth and development of the Dominion and the progress of industry, science and art throughout the world.

Appointments Vacant

Manager and chief engineer for the Delhi Central Electric Power Authority, Ltd.

Assistant electrical engineer for the Government of Johore.

Assistant mechanical and electrical engineers for the Air Ministry.

(See our classified advertisements.)

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

DESMOND portable water heater.

WARTBURG torch lamp bulbs.

ELMONTE breakfast cookers.

ICE AGE drink mixer.

HIGHTENSITE insulating material.

DURANA ELECTRA copper.

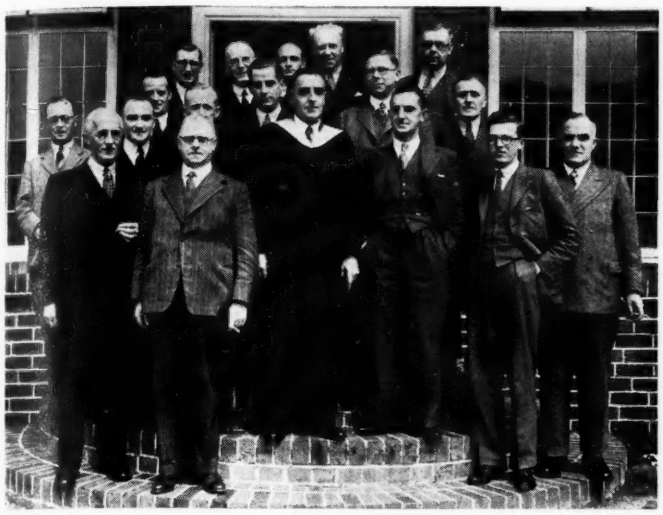
MACO templates

Honey extractor.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. E. Strong, A.M.I.E.E., A.M.I.C.E., has been recommended by the Liverpool Electric Power and Lighting Committee for the post of chief technical assistant of distribution in the Electricity Department at a salary of £600 per annum.



A group outside the offices of the S.W. & S. Electric Power Co. at Mucklow Hill, Halesowen, following the presentation of his academic robes for the degree of Master of Engineering to Mr. E. Morgan

Mr. D. E. Hayter, A.M.I.E.E., resident engineer and manager of the Burnham and District Electric Supply Co., Ltd., is resigning at the end of the month to take up an appointment with the Air Ministry. **Mr. M. Burford,** district manager of the North Somerset Electric Supply Co., Ltd., at Highbridge for a number of years, has been appointed to fill the vacancy.

Mr. M. Whitgift, hon. secretary and treasurer of the Batti-Wallahs' Society, tells us that he has moved to 5, Parkside, Cheam, Surrey. (Telephone: Vigilant 5010.)

Mr. T. J. Jones, formerly sales director of the Stella Conduit Co., Ltd., has been appointed sales engineer to Ward & Goldstone, Ltd., for London and district. His office will be at the London depôt of the company at 5, Percy Street, W.1.

Mr. H. Anderson has been appointed meter engineer to Ealing Electricity Department at a salary of £387 per annum.

Brighton Corporation has appointed **Mr. Winston Robinson** as transport manager for the immediate purpose of making preparations for the conversion of the trams to trolley-buses, the provision of omnibuses, plant, &c., for carrying out the Corporation's obligations under the Transport Bill and agreements, and (except as to running the trams until they are abandoned) acting as general manager of the Corporation's transport undertaking at a salary of £1,000 a year, rising to £1,200.

Mr. W. H. Bulpitt, managing director of Bulpitt & Sons, Ltd., has been appointed a Justice of the Peace for the City of Birmingham.

Mr. T. H. Carr has resigned his position as assistant construction engineer to the Sheffield Corporation Electricity Department to take up the post of technical assistant to the borough electrical engineer at Derby. On leaving he was presented with text books from his colleagues. Mr. Carr received his technical training at the Rutherford Technical College, Newcastle-on-Tyne, and served his apprenticeship with J. Spencer and Sons, Ltd., and Sir W. G. Armstrong Whitworth and Co., Ltd., subsequently holding appointments with A. Reyrolle & Co., Ltd.; Merz and McLellan; and the North-Eastern Electric Supply Co., Ltd. Before going to Sheffield he was inspecting engineer to the National Boiler and General Insurance Co., Ltd., and also part-time lecturer at the Rotherham College of Technology. He is an associate member of the Institutions of Electrical and Mechanical Engineers and a member of the Association of Mining Electrical Engineers.

Mr. T. H. Carr

Mr. E. Morgan, managing director of the S.W. & S. Electric Power Co., was presented by the senior members of the staff with the academic robes for the degree of Master of Engineering recently conferred upon him by the University of Liverpool, following a luncheon in the restaurant at the company's offices at Mucklow Hill, Halesowen, on July 15th. The chair was taken by Mr. A. B. Hodson, the chief accountant, and the actual presentation was made by Mr. W. Burton, M.Eng., the chief technical officer.

Mr. A. H. S. Oddy, B.Sc. (Eng.), A.M.I.E.E., of the Birmingham Corporation mains department, was married to Miss P. V. Ward, L.R.C.M., at St. Michael and All Angels Church, Knighton, on July 23rd. The mains department staff presented Mr. Oddy with a radio set.

Mr. C. Sohm has joined the board of the Euston Manufacturing Co., Ltd., in connection with the development of the signs department, which has recently been completely reorganised.

Dr. Julian C. Smith, president of the Stawinigan Water & Power Co., has been re-elected a member of Council, resident in Canada, of the Institution of Civil Engineers.

Mr. Percy G. Campling, the Central Electricity Board's manager for East England and deputy manager for South-East England, has been appointed borough electrical engineer of Bedford in succession to Mr. R. W. L. Phillips, who retires in October. Mr. Campling is fifty-one years of age and received his technical training with Mr. F. M. Long, of Norwich. He has held positions as assistant engineer at Bury St. Edmunds, Middlesbrough, Weymouth and Bermondsey, and was for eight years chief engineer of the Rhondda Tramways Supply and the Rhondda Valley Tramways. Subsequently he became chief engineer and general manager of the Electricity Supply and Transport Departments of Great Yarmouth, where he was responsible for the change-over schemes, power station extensions and other alterations, costing altogether £450,000. While he was at Great Yarmouth the output of the undertaking rose by 600 per cent., the available capacity of the works being increased five-fold. The scheme for the interconnection of the Norfolk and Suffolk undertakings was prepared by him as nominee of the undertakings. Since his appointment by the Central Board as district manager for East England in 1930 he has been responsible for the constructional work, maintenance and operation in the whole area. Since the completion of this scheme in the remarkably short time of under two years (it was actually finished in April, 1932), Mr. Campling has been assisting with the South-East England Scheme.

[Elec. Rev. photo.

Mr. P. G. Campling

Obituary

Mr. A. W. Makovski.—The death occurred last Sunday, at his home at Godalming, of Mr. Albert Waterlow Makovski, M.I.E.E., until about three years ago managing director of Tamplin & Makovski, Ltd., the well-known electrical contractors of Reigate, Surrey. He was sixty-five years of age.

Mr. C. S. Allerton.—The death occurred recently, at the age of fifty-three, of Mr. Carl Samuel Allerton, station engineer at the Lowestoft Electricity Works, with which he had been connected since he left Framlingham College.

Sir N. B. Saklatvala.—The death is reported from Aix-les-Bains of Sir Nowroji Bapuji Saklatvala, K.B.E., C.I.E., who was chairman of the Tata concerns in Bombay, including the Tata Power Co.

Mr. J. I. Merrie.—The death has occurred of Mr. James Ingram Merrie, electrical engineer and contractor, Kilbirnie, Ayrshire. He served his apprenticeship with Malcolm &

Allan, electrical engineers, Glasgow. He gave up business in 1933 owing to ill-health.

Mr. A. S. Howarth, managing director of A. S. Howarth, Ltd., electrical contractors, Toad Lane, Rochdale, died last week.

Mr. E. F. Hetherington.—We regret to report the death last Friday, at the age of fifty-two, of Mr. Edward Friend Hetherington, chief engineer and manager of the West Midlands Joint Electricity Authority. For twenty years Mr. Hetherington held a responsible position with the North Metropolitan Electric Power Supply Co. in connection with its generating plant before his appointment in 1926 as senior assistant to Mr. S. T. Allen, then chief engineer and manager of the West Midlands Joint Electricity Authority. When Mr. Allen was appointed to take charge of the Central England Area of the Central Electricity Board in 1928, Mr. Hetherington succeeded him and was responsible for the design and construction of the Ironbridge generating station opened in 1932, and subsequent extensions now being carried out. The West Midlands Authority's technical scheme was worked out under his direction and control. Mr. Hetherington was a member of the Institutions of Electrical and Mechanical Engineers.

[Whitlock & Sons, Ltd.
The late Mr. E. F. Hetherington

Mr. J. L. Packer.—We regret to announce the sudden death on July 21st of Mr. John Lewis Packer, superintendent of the paper-insulated cable making department of the Prescot works of the British Insulated Cables, Ltd., since 1902. He was in his sixty-third year and had been for over forty-one years in the service of the B.I., having joined its staff in January, 1897, on completion of his training at Penywern House. His long experience and a flair for choosing the right method of cable manufacture were of unusual value to his company and the electrical industry generally. Debarred by deafness from service with the forces, he was acting works manager at Prescot during the war, in addition to running his own department. A keen sportsman and a well-known fisherman, he was universally liked and respected by a wide circle of friends both within and outside the B.I. organisation.

The late Mr. J. L. Packer

Wills.—The late **Mr. Thomas Henry,** chairman of Bellis & Morcom, Ltd., left £204,126 (net personalty £197,612).

The late **Mr. Arthur Mortimer Codd** left £18,650 (net personalty £15,070).

Lady Callender, wife of Sir Thomas Callender, managing director of Callender's Cable & Construction Co., Ltd., left £49,611, with net personalty £48,716.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Preselector Dials, Ltd.—Private company. Registered July 15th. Capital, £100. Objects: To acquire from E. Shipton and O. D. Kennedy the benefit of certain existing inventions relating to a selecting device for use with telephone apparatus, and to carry on the business of manufacturers of and dealers in automatic and other telephones, &c. The subscribers are: E. Shipton, "Deanshurst," 155, High Road, Woodford Wells, Essex, and G. L. Addison, 2, Bond Court, Walbrook, E.C.4. Registered office: 12-15, Dartmouth Street, Westminster, S.W.1.

T.K. Products (Liverpool), Ltd.—Private company. Registered July 5th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in accumulators, batteries and wireless sundries, and wireless and electrical equipment, &c. The permanent directors are: M. H. Kitchen, 66, Blackhorse Lane, Old Swan, Liverpool, and D. D. Thorpe, 147, Prescot Road, Liverpool. Registered office: 19, Upper Newington, Liverpool.

N. G. Bailey & Co., Ltd.—Private company. Registered July 22nd. Capital, £10,000. Objects: To acquire the business of an electrical engineer carried on by N. G. Bailey at 29/30, Trinity Street, Leeds, as N. G. Bailey & Co. The directors are: N. G. Bailey and Mrs. Beryl E. Bailey, both of "Craigmere," Larkfield Road, Rawdon, near Leeds. Solicitors: Barrett, Chamberlain & McDonnell, Otley, Leeds and Harrogate.

Hellermann Electric, Ltd.—Private company. Registered July 21st. Capital, £100. Objects: To carry on the business of dealers in and manufacturers and suppliers of electrical goods and in particular to exploit under licence all those articles, materials and processes for binding, insulating and marking electric conductors with special patent rubber sleeves. The directors are: P. Hellermann, Kirchenallee 57, Hamburg, and J. Bowthorpe, 4, Chaldon Way, Coulsdon, Surrey (director of Goodliffe Electric Co., Ltd.). Secretary: D. W. Plunkett. Registered office: 1-2, Savoy Parade, London Road, Croydon.

Bradby's Engineering Works, Ltd.—Private company. Registered July 20th. Capital, £200. Objects: To acquire the business of Bradby's Engineering Works carried on by W. G. Cox at 31, Palace Gate, Kensington, W.8, and to carry on business as manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, &c. The directors are: W. G. Cox and E. E. A. Hitch, both of 31, Palace Gate, Kensington, W.8. Registered office: 13, Southampton Street, W.C.1.

N. E. P., Ltd.—Private company. Registered July 21st. Capital, £100. Objects: To carry on the business of manufacturers, factors, merchants and hirers of vacuum cleaners, and other mechanical cleaning machines and domestic appliances, &c. A. Meredith-Owens, 263, Rotton Park Road, Birmingham, is the first director and secretary. Registered office: 15, Snow Hill. Birmingham.

Crystal Electric Co., Ltd.—Private company. Registered July 21st. Capital, £500. Objects: To carry on the business of manufacturers and repairers of and dealers in apparatus and supplies used in the electrical trade. &c. The directors are: A. E. Parker, 50. Filey Road. Scarborough, and T. Eland, 211, Prospect Road, Scarborough. Registered office: 6, Queen Street, Scarborough.

Vialux, Ltd.—Private company. Registered July 23rd. Capital, £5,000. Objects: To carry on the business of electricians, mechanical engineers, manufacturers of luminous electric discharge and other tubes, high-voltage protective apparatus, electrical condensers, radio apparatus, &c. The directors are: F. J. Delbecke, "Brinsdale," Tenterden Grove, Hendon, N.W.4, and two others. Registered office: 20, Dering Street, W.1.

C. T. Wright, Ltd.—Private company. Registered July 18th. Capital, £200. Objects: To carry on the business of electrical engineers, contractors, merchants and factors, wireless telephone and television engineers, &c. The directors are: P. Stevens, Market Lane, Dover, and two others. Registered office: 142, London Road, Dover.

Returns of Electrical Companies

F. A. Laws, Ltd.—Debenture charged on the company's undertaking and other property, present and future, including uncalled capital, dated June 8th, 1938, to secure £1,930 and further advances. Holder: E. K. Farley, 6, Monahan Avenue, Purley. Satisfaction on June 8th, 1938, of debenture dated January 15th, 1937, and registered January 20th, 1937. (According to the register of mortgages the only deed registered January 20th, 1937, was a charge which originally secured £244 and further advances.

T. Barratt & Co. (Electrical Engineers), Ltd.—Capital, £1,000 in £1 shares. Return dated August 20th, 1937 (filed March 31st, 1938). 600 shares taken up. £600 paid. Mortgages and charges, nil.

Sign Accessories Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1937 (filed May 23rd, 1938). All shares taken up. £100 paid. Mortgages and charges, nil.

E. P. Allam & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated February 25th, 1938. 5,250 shares taken up. £2 paid. £5,248 considered as paid. Mortgages and charges, nil.

Associated P. A. Equipments, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated June 17th, 1938, to secure £850. Holder: John H. Houghton, 5, Holmesdale Road, Kew, Surrey.

Eastnor Electric Co., Ltd.—Capital, £500 in £1 shares. Return dated June 7th, 1937 (filed May 12th, 1938). 300 shares taken up. £300 paid. Mortgages and charges: £550.

White, Drummond & Co., Ltd.—Capital, £350.000 in £1 shares. Return dated April 8th. 65,000 shares taken up. £54,500 paid. £10,500 considered as paid. Mortgages and charges nil.

Geo. Bray & Co., Ltd.—Capital, £160,000 in 80.000 preference and 80,000 ordinary shares of £1. Return dated April 14th. 55.000 preference and 55,000 ordinary shares taken up. £7 paid. £109,993 considered as paid. Mortgages and charges: £40,000.

J. G. Sneath, Ltd.—Capital, £3,000 in £1 shares. Return dated March 29th. All shares taken up. £1,969 paid, £1,031 considered as paid. Mortgages and charges nil.

Northampton Electric Light & Power Co., Ltd.—Capital, £1,000,000 in £925.000 ordinary stock and shares of £1 and £75.000 preference stock and shares of £1. Return dated May 18th, 1938. £870.000 ordinary and £52.500 preference stock taken up. £922.500 paid. Mortgages and charges: £600,000.

H. J. Cash & Co., Ltd.—Capital, £25,000 in £1 shares. Return dated March 15th. 16 000 shares taken up. £11,000 paid. £5,000 considered as paid. Mortgages and charges, nil.

City Notes

The Victoria Falls & Transvaal Power Co., Ltd.—Presiding at the ordinary general meeting on Tuesday, Mr. A. E. Hadley, chairman and managing director, said that the good position of the gold-mining industry augured well for the continued use of the company's installations and for further expansion of them. The demand for power increased during 1937 by 57,000 kW and the sales by 345 million kWh. Forecasts indicated that the annual rate of increase might continue at about 50,000 kW for the next four years and to meet these demands the last section of the Klip station comprising six 33,000-kW sets was being rapidly proceeded with. The station should be practically completed by the end of 1939, when it would have an installed capacity of 400,000 kW. A further installation of 100,000 kW was to be established at the new Vaal station by the Electricity Supply Commission and the company in co-operation. While the generating plant would be financed by the Commission, a further outlay of between £2,000,000 and £3,000,000 would be required for transmission, distribution and other extensions, apart from renewals. In 1937 a very satisfactory reduction in the charges for power was made, the rebate being £185,000 higher than in the previous year.

The London Electrical & General Trust.—At the ordinary general meeting held on Monday, Mr. H. S. H. Guinness, the chairman, stated that in common with other investment trusts their portfolio had suffered a contraction in market value, and whereas for some years past he had been able to record that the market value of investments was in excess of their book value, this year there was a depreciation of 13.6 per cent., which, if reserve and undistributed profits were taken into account, was reduced to 11.6 per cent. Investments in British Empire countries had stood up best and had justified the policy of steadily increasing the proportion held within the Empire from 36 per cent. four years ago to 64 per cent. to-day. Outside the Empire political and economic disturbances had had their inevitable effect on security prices.

Thomas Bolton & Sons, Ltd.—Presenting his report at the annual meeting held last Friday Mr. G. H. Nisbett, chairman, stated that the reorganisation and co-ordination of the company's factories and plant which had been in hand for some years had yielded good results, but this work having approached completion they could not expect an appreciable increase of profit in this direction. On the other hand, they had not reaped the full effect of the extension of buildings and plant. Some recession must be expected in certain directions in the amount of business they had recently been doing, but taking everything into consideration he did not expect the current year's results to be very different from those for last year.

Philips' Incandescent Lamp Works, of Eindhoven, held their annual meeting last Friday. Dr. A. F. Philips, the president, said that the company's policy of expansion had to be further pursued in the ultimate interest of shareholders, the new capital investment being necessary in order not to lose certain markets and to acquire new ones. Owing to the increase in wages and the devaluation of the franc, results in France were unfavourable, while the less satisfactory trading in Austria was a result of the adjustment of the Austrian currency. Hire-purchase sales amounted to 10 per cent. of the total sales, the security of hire-purchase debtors actually being greater than that of ordinary debtors.

The East African Power & Lighting Co., Ltd., reports a profit of £84,914 for 1937, against £89,901 for 1936. Depreciation absorbs £19,532 (£19,186), general reserve £5,000 (£10,000), and Kenya tax £2,279 (£2,552 off preliminary development account). The carry forward shows a decrease from £11,319 to £10,272. Sales of electricity in Kenya have increased by approximately 13 per cent., while both the Tanganyika Electric Supply Co. and the Dar-es-Salaam and District Electric Supply Co. have continued to show a steady improvement. In Uganda the construction of the power stations and distribution systems supplying Kampala, Entebbe and Jinja is nearing completion.

Bennis Combustion, Ltd.—Last year the total turnover of the company was considerably higher than in previous years. Unfortunately, however, said Mr. A. W. Bennis (chairman and managing director), at the annual meeting on Monday, profits did not advance in direct ratio, this being due mainly to increase in the wage bill and the cost of raw materials and also to the large amount of Government work which was not so remunerative as ordinary contracts. The value of outstanding contracts showed a substantial increase as compared with the corresponding date last year.

The Anglo-Argentine Tramways Co., Ltd.—Competition accentuated by underground railway development and general fare-cutting was stated by the Duke of Athol (chairman) at the annual general meeting on Tuesday to be chiefly accountable for a big deficit in working. Other contributory factors were increasing costs and expenses. Sustained and increasing efforts had been made towards securing co-ordination of transport and they had confidence in the new corporation and in the will of the Government to make it a successful enterprise.

W. & T. Avery, Ltd.—The belief that the general downward tendency in business had been halted was expressed by Sir J. Fortescue Flannery, chairman, at the company's general meeting on Tuesday. Considerable progress, he said, had been made in the design, methods and manufacturing resources of the company, whose associated concerns in South Africa, Australia and New Zealand and the branches in India and elsewhere also showed advances.

The South Metropolitan Electric Light & Power Co., Ltd., is issuing £500,000 3½ per cent. debenture stock, redeemable 1955-1972 at par, and £500,000 £1 4 per cent. third preference shares at 20s. 6d. per share. The company, which is controlled by the County of London Electric Supply Co., Ltd., has an issued share capital of £1,025,000 in 150,000 7 per cent. cumulative first preference shares, 100,000 6 per cent. cumulative second preference shares and 775,000 ordinary shares, all of £1. Lists for the issue were closed at 9.30 a.m. on Tuesday, 63 per cent. of the debentures and 28 per cent. of the preference shares having been left with the underwriters.

Falk, Stadelmann & Co., Ltd., report a trading profit of £129,047 for the year ended March 31st last, as compared with £127,047 for 1936-37. Income-tax and N.D.C. take £16,684 (£10,463), while £1,400 (£5,000) is placed to reserve for investment depreciation, leaving a net profit of £110,963 (£112,105). After paying a dividend of 10 per cent. on the ordinary shares and transferring £15,000 (same) to general reserve and £3,000 (£5,000) to staff fund, £27,320 (£23,608) is carried forward.

The Ontario Hydro-Electric Commission.—According to *The Times* the Commission has sold $12,500,000 3 per cent. bonds, payable August 1st, 1950, to a syndicate headed by the Bank of Montreal. Of the proceeds $7,500,000 is to be used for general reconstruction work in Southern Ontario and $2,500,000 for new developments in Northern Ontario.

The United Dominions Trust, Ltd.—At the annual meeting last week Mr. J. Gibson Jarvie, chairman and managing director, stated that the United Dominions Trust (Electric), Ltd., continued to make progress. While a great deal of installation financing was carried out by municipal authorities, there was a large amount of business done through contractors and also in the actual purchase of equipment in which the company's services were regularly sought.

The Southern Railway Co., Ltd., is reducing the interim dividend on its five per cent. non-cumulative preferred ordinary stock from 2 to 1 per cent. Gross receipts for the half-year are £83,000 lower, but working expenditure has increased by £456,000, the net revenue being £574,000 less.

The Shawinigan Water & Power Co. reports a net revenue of $2,008,301 for the half-year ended June 30th, after meeting fixed charges. This compares with $2,202,962 for the corresponding period of last year. The quarterly dividend on the common stock is maintained at 20 cents a share.

The Ebonite Container Co., Ltd., announces a final dividend of 4 per cent. for the year ended February 28th (against 10 per cent. and a bonus of 4 per cent.), making 8 per cent. for the year (18 per cent.).

The Brixham Gas & Electricity Co., Ltd., announces that, in response to a recent offer for sale by tender of 30,000 4½ per cent. £1 preference shares, 63,240 shares were applied for, tenders ranging from the minimum up to 2s. 6d. premium.

The Richmond (Surrey) Electric Light & Power Co., Ltd., announces an interim dividend of 3 per cent. (same).

Vickers, Ltd., are paying dividends of 2½ per cent. on their preferred 5 per cent. stock, 5 per cent. preference stock and cumulative preference stock.

The City of London Electric Lighting Co., Ltd., proposes to pay a dividend of 3½ per cent. (same) on its ordinary stock for the half-year ended June 30th.

The Yorkshire Electric Power Co. is to pay an interim dividend of 3 per cent. (same).

W. T. Henley's Telegraph Works Co., Ltd., announces an interim dividend of 5 per cent. (same).

The County of London Electric Supply Co., Ltd., is maintaining its interim dividend at 3 per cent.

The Bournemouth & Poole Electricity Supply Co., Ltd., is to pay an interim dividend of 6 per cent. (same).

The South London Electric Supply Corporation, Ltd., is maintaining its interim dividend at 3 per cent.

Mather & Platt, Ltd., are maintaining their interim dividend at 4 per cent.

The London Electric Supply Corporation, Ltd., is maintaining its interim dividend at 3 per cent.

The Electrical Industries Trust announces a final distribution of 6 per unit, tax free, making 9.2d., tax free, for the year (against 9.4d., tax free).

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets are unable to escape from shadows cast by foreign politics, with Czechoslovakia as the nigger in the hedge. Added to this, as a restraint upon activity, is the influence of the forthcoming holidays. Business in the majority of markets comes so erratically as to be extremely patchy; for half an hour a market will find a lot of trade doing. Soon after, another department will come into prominence, the first subsiding into the background.

In the home markets the railway dividends are disappointing. Amongst communication stocks, the Cable and Wireless group steadily holds its ground. New issues are meeting with a very fair reception from the public. The pact between this country and the United States is deemed a bull point for industry on both sides of the Atlantic.

Home Rails Depression

The market in home railway stocks was staggered badly by the half-yearly profits and dividend statements of the Southern and L.N.E.R. lines. Prices were first marked down heavily on the cut in the Southern preferred interim dividend from 2 to 1 per cent.; but confusion was worse confounded by the inability of the L.N.E.R. to pay anything on the preference stocks, or to meet interest on the guaranteed stocks save by drawing from reserves. The traffic receipts published each week by the companies had braced expectation against unfavourable results. These proved in the event, however, to be a great deal worse than had been bargained for. Profits have been caught, it seems, between the upper and nether millstones of mounting costs and falling trade. Since the middle part of last week, consternation has been reflected in

such price-falls as from 68 to 59½ in Southern preferred, and from 43 to 31½ in L.N.E.R. first preference stock. London Passenger Transport "C" stock is 1½ down at 74. Two years ago the price was 104.

Cable and Wireless

June was the second full month in which were operative the reduced charges made by Cable and Wireless for inter-Empire communications. Hopefulness regarding the success of the new scheme was, therefore, much encouraged by the advance in the traffic index from 65.3 in May to 66.4. Not only is the gain against the usual run of traffics at this time of year, but the difference of 10 per cent. between the latest figure and last year's corresponding number is substantially smaller than has been the case in past months. On these considerations, in conjunction with the prospect of greater liveliness in transatlantic communication, prices of all three of the combine's stocks have risen, the ordinary by 2½ points to 55; the preference by 1½ to 99; and the income stock by 1 to 102. Globe Telegraph ordinary is ¼ up at 15¾.

Callenders and Cromptons

Activity in the shares of Callender's Cable and Crompton Parkinson is kept moving by anticipation concerning the terms on which the two companies will agree to the merger. On the preliminary announcement a little more than a week ago, the price of Crompton Parkinsons had remained unchanged at 30s., while Callenders had risen 7s. 6d. to 5½. Subsequently, the latter have come back to 4 19/32, with Cromptons still marking time. Compared with the prices of a month ago, both shares show good advances, inspired at first by rumours of the negotiations now officially announced to be in progress for the formation of a holding company into whose stock the proprietors of both companies will be invited to exchange their holdings.

Electrical Equipment Shares

Such encouragement as the industrial markets may have felt by reason of the improvement which has spread over the Anglo-American prospect was sobered to some extent by the Home Railway section. From the market point of view, the two factors appear to have cancelled each other out, for share prices are again generally unchanged on the week. The electrical equipment market can show little more noteworthy than 6d. rises in General Electrics at 77s. 6d. and English Electrics at 31s. 6d. Ericssons fell further to 38s. 9d. after an earlier recovery to £2. British Aluminiums are dull, at 49s. 6d., on the cut in the price of aluminium—the first reduction in six years—although most people recognise the stimulating effect which this policy should exercise on demand.

The Brush Electrical Engineering Co. notifies that the Court has approved the scheme of arrangement and capital reduction. Stockholders will receive next September official notice from the company as to the offer of the new stocks. Meanwhile, proprietors are informed that their holdings of ordinary stock are reduced to one-fourth of the nominal amount shown on the stock certificate.

American Affairs

Wall Street has behaved this week in less aggressively optimistic fashion, but the slight reactions pale into insignificance when compared with the upward leaps and bounds of prices earlier in the present month. Having regard to the sway exercised by America on London markets, opinion here waits rather anxiously for definite evidence that Wall Street is not taking too much for granted in the way of trade recovery. Some distrust of the future is felt also on account of the boomlet having sprung up so soon after the rising of Congress. The inference is that Wall Street intends to make somewhat hectic holiday now that the threat of adverse legislation is temporarily out of the way. Exuberant bullishness may be brought abruptly to earth when the U.S. Administration returns to work, possibly with plenty of power in the New Deal elbow for continuing the campaign against the business community. At present various indices point to a small, but definite, improvement in business activity. In the general rise of stock prices utility issues have hung behind the others, the U.S. Government threatening to bring into play the cheerfully named "death-sentence" clause, in the case of the Utilities Power & Light Corporation.

New Issues

Offers by industrial companies of debenture and preference stocks have been recently coming forward fairly freely to relieve the present pressure of demand for investments of this kind. Reception of these offers has been good wherever the security and the price of issue were considered as being in proper relationship. Midland Counties new 3½ per cent. debentures, recently offered at par, can now be bought at a shade below that figure. Such is the security behind the stock that the running yield is scarcely higher than the return on War Loan. This week has seen the South Metropolitan Electric company's offer of 4 per cent. preference shares at 20s. 6d. and of 3½ per cent. debenture stock at par. The subscription-lists closed at 9.30 on Tuesday morning. The lately-issued B.C. & H. Power Station 3½ per cent. first mortgage debenture stock can be bought, still free of stamp duty, at ⅛ premium over the prospectus price of 99. The yield is £3 10s. 6d. per cent., or a trifle more allowing for redemption in 1963.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price July 26.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	66/3	—	4 10 7
City of London	1	7½	7½	33/6	—	4 9 7
Clyde Valley	1	7	8	37/6	+6d.	4 5 4
County of London	1	10½	10½	49/6	—	4 4 7
Edmundson's 7% Pref.	1	7	7	32/6	—	4 7 6
Do. Ord.	1	8	9	27/6	—	—
Elec. Dis. Yorkshire	1	9	9	42/6	—	4 4 9
Elec. Fin. and Securities	1	12½	12½	50/-	—	5 0 0
Elec. Supply Corporation	1	11	12	53/9	—	4 9 5
Lancs Light and Power	1	7½	7½	32/-	—	4 13 9
Lond. Assoc. Electric	1	—	7	30/-	—	4 13 4
London Electric	1	8	7	35/6	—	3 19 0
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	12	50/-	—	4 16 0
Midland Counties	1	7½	8	38/-	—	4 4 3
Mid. Elec. Power	1	8	9	40/9	—	4 8 3
North Eastern Electric Ordinary	1	7	7	33/-	—	4 4 10
Do. 7% Pref.	1	7	7	33/-	—	4 4 10
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 0
Do. do. 6% Pref.	1	6	6	29/6	—	4 1 4
Scottish Power	1	8	8	38/-	—	4 4 3
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8 0 0
Yorkshire Elec.	1	8	8	41/-	—	3 18 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	115	—	4 7 0
Do. 1955–75	,,	5	5	116½	+½	4 5 10
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	100½	+½	3 9 6
London Elec. Trans. Gtd.	,,	—	2½	92	—	2 14 4
London & Home Counties, 1955–75	,,	4½	4½	112½	—	4 0 0
London Passenger Transport, A.	,,	—	4½	118½	—	3 16 9
Do. do. B.	,,	—	5	119½	—	4 3 8
Do. do. C.	,,	4	4½	74	−1½	5 14 10
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	142½	—	6 6 4
Anglo-Am. Tel. Pref.	Stock	6	6	110	+1½	5 9 1
Do. Def.	,,	1½	1½	26	—	5 15 5
Cable & Wireless 5½% Pref.	,,	4½	5½	99	+1½	5 11 1
Do. Ord.	,,	—	4	55	+2½	7 5 6
Do. Income	,,	—	—	102	+1	3 18 2
Globe Tel. & Tel. Ord.	10	5½*	7½*	15¾	+¼	4 9 0
Do. do. Pref.	10	6	6	13⅜	—	4 8 1
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	27/6	—	5 9 1
Oriental Telephone Ord.	1	12*	12*	58/9	—	4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	5/-	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	13	—	—
British Electric Traction Def. Ord.	,,	5	5	1025	—	—
Do. do. Pref. Ord.	,,	8	8	170	—	4 14 2
Brazil Traction	$100	70 cts.	$1	13½	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	100	—	5 0 0
Mexican Light Common	$100	Nil	Nil	1	—	—
Do. do. 1st Bonds	$500	5	5	27½	—	—
Victoria Falls Ord.	1	12	13½	73/9	+⅛	3 13 2
West Riding	1	6½	10	35/-	—	—
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	1⅝	—	9 4 8
Assoc. Elec. Ord.	1	10	10	39/-	—	5 2 7
Do. Pref.	1	8	8	36/6	—	4 7 6
Babcock & Wilcox	1	10	10	40/-	—	5 0 0
British Aluminium Ord.	1	10	12½	49/6	−3/-	5 1 0
British Insulated Ord.	Stock	20	20	4½	—	4 6 6
Brush Ord.	,,	Nil	Nil	26½	—	—
Callenders'	1	20	20	4 19/32	+7/32	4 1 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	30/-	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	10	12½	32/6	—	7 13 10
Enfield Cable Ord.	1	25	25	2½	—	—
English Electric	1	Nil	10	31/6	+6d.	6 7 0
Do. do. Pref.	1	6½	6½	26/-	—	5 0 0
Ericsson Tel.	5/-	25	25	38/9	−9d.	3 4 5
Ever Ready	5/-	45	35	20/6	−3d.	8 10 8
Ferranti Pref.	1	7	7	27/6	—	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	17½	20	77/6	+6d.	5 3 0
Henley's	5/-	15	20	21/3	—	4 14 1
Do. 4½% Pref.	1	4½	4½	1 1/16	—	4 4 8
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	10	12½	38/3	—	6 17 9
Lancashire Dynamo	1	20	25	3	—	8 6 8
Siemens Ord.	1	7½	7½	25/-	- -	6 0 0
Telegraph Construction	£1	7½	10	2	—	5 0 0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

26181. "Ground protective relay device for electrical equipment." J. H. Martin and H. L. Sheppard. September 26th, 1936. (487935.)

29434. "Road-traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., F. A. Downes and H. J. N. Riddle. October 29th, 1936. (488024.)

29563. "Cathode-ray devices." British Thomson-Houston Co., Ltd., and D. Gabor. October 30th, 1936. (488188.)

32003. "Electric motor controllers, particularly for electrically driven vehicles." C. J. Gordon. November 23rd, 1936. (487860.)

32429. "Electric eddy current brakes." A. Mandl and Metropolitan-Vickers Electric Co., Ltd. November 26th, 1936. (487865.)

32542. "Alternating current watt-hour meters." British Thomson-Houston Co., Ltd. November 30th, 1935. (487867.)

32661. "Thermionic valves and thermionic valve circuit arrangements for use on short waves." Telefunken Ges. für Drahtlose Telegraphie. November 30th, 1935. (488094.)

32935. "Transmitter with spiral-aperture discs." Radio Akt.-Ges. D. S. Loewe. December 2nd, 1935. (488253.)

35295. "Electrical wave filters." E. C. Cork and J. L. Pawsey. December 23rd, 1936. (488254.)

35466. "Television transmitters." F. A. Lindemann. December 28th, 1936. (487940.)

35489. "Electron oscillators." Ferranti, Ltd., N. H. Searby, and G. M. Tomlin. December 28th, 1936. (487870.)

35633. "Time base circuits for cathode-ray oscillographs." British Thomson-Houston Co., Ltd., and K. J. R. Wilkinson. December 29th, 1936. (488031.)

35634. "Electric selective control systems." British Thomson-Houston Co., Ltd., G. L. Pearson, and A. S. Wallis. December 29th, 1936. (488096.)

35805. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. December 31st, 1935. (488268.)

35868. "Control equipments for electrical apparatus." W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. December 31st, 1936. (488259.)

35885. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. December 31st, 1936. (488111.)

35886. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. December 31st, 1936. (488112.)

35887. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. December 31st, 1936. (488260.)

35888. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. December 31st, 1936. (487880.)

35890. "Frequency changer circuits for use in radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. (G. L. Grundmann). December 31st, 1936. (Convention date not granted.) (488269.)

1937

51. "Electric cable clips." F. S. Lobl. January 1st, 1937. (488263.)

54. "Measurement of Röntgen rays." W. W. Groves (I.G. Farbenindustrie Akt.-Ges.). January 1st, 1937. (487884.)

82. "Electric incandescent lamps." E. M. N. Korving. January 1st, 1937. (488202.)

95. "Electric-light pendants." H. R. Prickett. January 1st, 1937. (488204.)

124. Electric arc-discharging devices." British Thomson-Houston Co., Ltd. January 2nd, 1936. (488209.)

190. "Phase-adjusting arrangements for alternating-current electromagnets." Siemens Bros. & Co., Ltd., and L. O. Deacon. January 4th, 1937. (487887.)

214. "Tuning-controls for radio receivers." Marconi's Wireless Telegraph Co., Ltd. January 3rd, 1936. (Addition to 487687.) (488266.)

242. "Controllers for electric motor equipments." W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. January 4th, 1937. (488219.)

408. "Optical arrangement for scanning machines." Radio Akt.-Ges. D. S. Loewe. January 10th, 1936. (488221.)

945. "Electric amplifiers involving thermionic valves and the like." General Electric Co., Ltd., and K. A. Macfadyen. January 12th, 1937. (487953.)

1090. "Electromagnetically operated vehicle direction-indicators. C. J. Evans and S. C. Evans. January 14th, 1937. (487890.)

1595. "Insulating bodies adapted to stand high temperatures." General Electric Co., Ltd. (Patent Treuhand-Ges. für Elektrische Glühlampen). January 19th, 1937. (Cognate application 25193/37.) (487957.)

1597. "Methods for sealing off vessels filled with gas to pressure higher than atmospheric." General Electric Co., Ltd. (Patent Treuhand-Ges. für Elektrische Glühlampen). January 19th, 1937. (487891.)

2937. "Mercury-arc [illegible]rtors." General Electric Co., Ltd., and C. R. Dunham. February 1st, 1937. (487898.)

2979. "Ceramic masses for electrical insulation." C. Schusterius. January 30th, 1936. (Cognate application 2980/37.) (487961.)

3198. "Secondary emission electron multipliers." General Electric Co., Ltd., C. H. Simms and L. R. G. Treloar. February 3rd, 1937. (487899.)

3981. "Edison-screw lampholders." General Electric Co., Ltd., and J. H. Gunn. February 10th, 1937. (488119.)

4772. "High-frequency current transformers." C. Lorenz Akt.-Ges. February 18th, 1936. (488120.)

6690. "Terminals or connectors for cables, conductors, and the like." R. Wester and E. Ebbinghaus (trading as Wester, Ebbinghaus & Co.). March 6th, 1936. (487972.)

6792. "Cathode-ray tubes and the like." General Electric Co., Ltd., J. E. B. Jacob, L. C. Jesty and G. W. Seager. March 8th, 1937. (487974.)

7561. "Incandescent electric lamps." C. H. Mapleson. March 16th, 1936. (487903.)

8287. "Electric battery lamps." Ever Ready Co. (Great Britain), Ltd., and M. C. Terry. March 20th, 1937. (488124.)

9331. "Drop indicators for use in telephone circuits." Albiswerk Zurich Akt.-Ges. April 1st, 1936. (487904.)

10034. "Radio receiving sets." A. H. Stevens (J. B. Smiley). April 8th, 1937. (487977.)

13422. "High-pressure mercury-vapour electric-discharge lamps." General Electric Co., Ltd., and J. W. Ryde. May 11th, 1937. (488047.)

14028. "Electrolytic cells." W. Thomas and E. L. Davies. October 30th, 1936 (Divided out of 466708.) (488128.)

14761. "Coating of articles by means of cathode disintegration." B. Berghaus. May 27th, 1936. (Cognate application 14762/37.) (488131.)

15238. "Method of metallisation by cathode disintegration." B. Berghaus. June 17th, 1936. (488132.)

16114. "Thermionic valve circuits." Egyesult Izzolampa Es Villa-Mossagi R.T. June 10th, 1936. (487913.)

16952. "Electrical systems." J. E. G. Eurich. June 18th, 1937. (Cognate application 21255/37.) (488235.)

18495. "Short-time switches operating with the aid of controlled current-converters." Siemens-Schuckertwerke Akt.-Ges. July 2nd, 1936. (487982.)

19311. "Radio direction-finders." Telefunken Ges. für Drahtlose Telegraphie. July 15th, 1936. (487984.)

20249. "Railway track circuits." General Railway Signal Co. August 21st, 1936. (488240.)

21950. "Heads for trolley poles for electric vehicles." Acieries de Gennevilliers. May 4th, 1937. (487923.)

22648. "Electric clockwork apparatus and method of synchronising same." Compagnie Industrielle de Mécanique Horlogere. January 6th, 1936. (Divided out of 485026.) (488065.)

24929. "Devices comprising gas-filled electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 16th, 1936. (488142.)

25501. "High-frequency inductance coil." H. Vogt. September 19th, 1936. (Cognate application 25502/37.) (487993.)

26864. "Electric switch." B. Herrman. October 4th, 1937. (488246.)

28496. "Metal vapour electric current rectifiers." Siemens-Schuckertwerke Akt.-Ges. October 19th, 1936. (488147.)

29225. "Oscillatory circuits." C. Lorenz Akt.-Ges. October 27th, 1936. (488076.)

29365. "Cathode-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 30, 1936. (487998.)

29968. "Arrangements for deriving electric power from a direct-current source through a transformer." Telefunken Ges. für Drahtlose Telegraphie. November 2nd, 1936. (487999.)

31057. "Rejector circuits for electrical apparatus having high or ultra-high frequencies." V. Poulsen and D. P. L. Grether. November 12th, 1936. (488081.)

31219. "Electric hot-water supplying apparatus." G. Bernstein. November 13th, 1937. (488082.)

31549. "Electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 19th, 1936. (488150.)

34073. "Receivers for carrier-telephony." W. W. Triggs. (Wired Radio, Inc.) December 9th, 1937. (488157.)

34143. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. July 11th, 1937. (Addition to 472739 and 478775.) (488158.)

1938

4065. "Conveyers for cylindrical articles and more especially dollies for electric cells." K. Bud and Economic Distributors. Ltd. February 9th, 1938. (488175.)

5894. "Electric multi-channel carrier signalling systems." Siemens & Halske Akt.-Ges. March 6th, 1937. (488177.)

5990. "Protective switching-apparatus for electric motors." F. Oldak. December 3rd, 1937. (488020.)

10423. "Device for periodically varying the directional characteristic of an aerial system." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 14th, 1936. (Divided out of 483427.) (488021.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 20th:—

Resokav. No. 582679. Class 8. Electric discharge valves (not for medical purposes), wireless telephonic and telegraphic transmitting and receiving apparatus, television transmitting and receiving apparatus, instruments and apparatus for the transmission and reception of signals and pictures, and parts of such instruments and apparatus.—Julius Pintsch Gesellschaft, Berlin, O.27, Germany. (British representatives: G. R. Redfern & Co., 15, South Street, E.C.2.)

Radiolab. No. 581971. Class 8. Electrical testing instruments and testing apparatus, all for use with radio receiving sets; and parts thereof.—Everett, Edgcumbe & Co., Ltd., Colindale Works, The Hyde, Hendon, N.W.9.

Hecla. No. 584163. Class 8. Electric cables, condensers, resistances and batteries (not for medical purposes), photo-electric cells, photometers, and electric measuring instruments, lamps for scientific purposes, wireless telephonic and television sets, loud speakers, &c.—Kooperativa Förbundet, Förening U.P.A., Stockholm, Sweden. (British representatives: J. E. Evans-Jackson & Co., 57-60, Holborn Viaduct, E.C.1.)

Mobilix. No. 586449. Class 11. Instruments, apparatus, and contrivances, not medicated, for surgical or curative purposes, or in relation to the health of men or animals.—Watson & Sons (Electro-Medical), Ltd., Sunic House, 43-47, Parker Street, Kingsway, W.C.2.

Coal Distribution

The first public meeting of the Departmental Committee, of which Sir Walter Monckton, K.C., is chairman, appointed to investigate the methods and cost of distribution of coal, coke and manufactured fuel, was to be held yesterday (Thursday) at Caxton Hall, London. Evidence was to be taken from the Central Council of Colliery Owners.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory, Minerva Road; N. Green & Co., Ltd., New Broadway Buildings, W.5.

Addiscombe.—Extensions to Grammar school; Mauger & May, architects.

Aylesbury.—Houses (88), and shops, Turnfurlong estate; H. C. Janes, Ltd.

Bakewell.—Houses (28), Wye Bank estate, for C. Bradbury.

Biggleswade.—Factory, Hitchin Street, for the Full Fashioned Hosiery Co.

Birmingham.—Factory, Mount Street, Nechells; Clark & Howard, Ltd. School, Wood End Lane, Erdington, for the E.C. Underground garage and shelter, New Market (£47,000), and extensions to Selly Oak Hospital (£15,099), Dudley Road hospital (£71,033) and sanatorium (£7,433); city engineer. Rebuilding the Gaiety Cinema, Coleshill Street, for the Associated British Cinemas, Ltd.; staff architect.

Blackpool.—Houses (26), Fifth Avenue, Stamford Street, &c.; E. Armitage, 34, Sheaf Street, Poulton, Preston. Houses (63) and garages, rear Abbotford Road; Pimley and Topping, South Bourne Road, Marton. Stores, Bankhey Street, for Marks & Spencer, Ltd.

Blaydon-on-Tyne.—Houses (260); U.D.C. surveyor.

Blofield.—Houses (77); R.D.C. surveyor.

Brentford.—Enlargement of isolation hospital (£10,475); Ealing, Brentford and Chiswick Joint Committee.

Bromsgrove.—Houses, Brick Kiln Lane, Wildmoor Lane and Middle Lane, Wythall; Messrs. Tredgold's, builders, Wythwood Farm, Wythall.

Caine.—Houses (56), North End; borough engineer.

Chester.—Extensions to Royal Infirmary (£139,260); H. V. Ashley & W. Newman, architects, 14, Gray's Inn Square, London, W.C.1.

Chester-le-Street.—Houses (92), Pelton Fell; U.D.C. surveyor.

Coseley.—Houses (108), Princes End estate; U.D.C. surveyor.

Coventry.—Houses (82), Kingsbury Road and Forfield Road; R. H. Pritchard, Kingsbury Road. Houses (80), Montalt Road, Woodstock Road and Eltham Road; Palace Builders (Coventry), Ltd., Crecy Road. Houses (30), Simon Stone Street; Bayliss Bros., Simon Stone Road. Houses (20), Stamford Avenue; H. C. Weller, 185, Ansty Road, Wyken Walsgrave-on-Sowe. Houses (20), Sullivan Road; L. Parsons, 13, Wainbody Avenue. Houses (32), Tonbridge Road and London Road; R. J. Aston, Marsh Hill, Erdington. Houses (32), Wyken Avenue, Wyken Croft; A. Hall & Son, builders, North Street. Art school, Butts site, for the E.C.

Crewe.—Factory for Rolls-Royce, Ltd.; W. G. Phillips, architect, Victoria Street, London, S.W.1.

Croydon.—New schools and extensions (£120,000), for the E.C. Enlargement of General Hospital, London Road; governors.

Dudley.—Houses (210), Yew Tree Hill estate; borough engineer. Houses (38) and shops, Saltwells Road; Roberts Bros.

Dumbarton.—Houses (198), Crosslet, for Corporation; burgh surveyor.

Durham.—School, Broom Cottages, for the C.C. (£78,150); G. W. Lazenby & Co., builders, Ferryhill.

Ealing.—Houses (114), Ferrymead Gardens; Comben & Wakeling, Ltd., 603, Kenton Road, Kenton, Harrow. Houses (62), Parkgate Drive; C. W. & W. Harding, Ltd., Heights Avenue, Greenford. Cinema and shops, Uxbridge Road; E. Schaufelberg, 106, Jermyn Street, S.W.1. Shops and flats, Danesmead Road; Bunting Construction Co., Ltd., 49, Baker Street, W.1.

Edinburgh.—Houses (36), Corbiehill Place; Muirhouse Building Co., Ltd.

Elland.—Houses (58), Heathfield estate; U.D.C. surveyor.

Felling-on-Tyne.—Houses (708), Wardley Hall estate; U.D.C. surveyor.

Gateshead.—Houses (597); borough engineer. Flour mill, the Saltmeadows (£250,000); J. Rank, Ltd., 107, Leadenhall Street, London, E.C.3. Extensions to factory for Jayess Clothing Co., Ltd.; Stephen Easten, Ltd., builders, Milburn House, Newcastle-on-Tyne. Reconstruction of Argyle Hotel, West Street; J. W. Lowry, contractor, Corporation Street, Newcastle-on-Tyne.

Halesowen.—Extensions to premises, for Walter Somers, Ltd., Haywood Forge.

Hartlepool.—School, West View; borough engineer.

Hendon.—Extensions to premises, E. W. Leech & Sons, Ltd., The Broadway, N.W.7.

Hetton-le-Hole (Co. DURHAM).—Houses (254), public baths, and extensions to Council Offices; A. H. Fennell, architect, Bridge End Chambers, Chester-le-Street.

Jarrow.—Extensions to Town Hall; borough engineer.

Kettering.—Three-storey building, Weldon Road; O. P. Drever & Son, contractors, Roundhill Road.

Lanarkshire.—General Hospital, Bellshill, for the County Council (£1,000,000); architect, County Council, Hamilton.

Lancashire.—Enlargement of technical college, Leigh (£21,868) for the County E.C.

Lancaster.—Houses (28), adjoining Coastal Road, Hest Bank; A. Whitehead & Co.

Leeds.—Motor works and showrooms, Bridge Street and Trafalgar Street, for Tate of Leeds, Ltd., New York Road; V. Bain, architect, 38, Albion Street. School, Sandford House estate (£30,525); city architect.

Leicester.—Alterations to premises, Eastgate, for British Home Stores, Ltd.; E. A. Scrivener, 39, Avenue Road, London, S.E.13.

Liverpool.—Cinema, Woolton Road, near Allerton Station, for R. D. French, 63, Marlborough Road; A. E. Shennan, architect, North John Street.

London.—(GREENWICH).—Houses, Cherry Orchard estate; borough engineer. (HACKNEY).—Rehousing, Daley Street; L.C.C. architect, County Hall, S.E.1. (HAMMERSMITH).—Tenements, White City site; Gee, Walker & Slater, Ltd. (HOLBORN).—Club and swimming pool; Y.M.C.A. (ISLINGTON).—Community centre, Canonbury Road; Mary Ward Settlement, 1, Tavistock Place, W.C.1. Dwellings, Canonbury estate, and flats, Highbury Park, and extension to Town Hall (£31,645); E. C. P. Monson, architect, Finsbury Pavement House, E.C.2. (POPLAR).—Rehousing, Elizabeth Place area; L.C.C. architect. (ST. PANCRAS).—Maternity block, L.C.C. Hospital (£41,856); E. Clarke & Sons, Ltd., Alpha Place, Manor Street, S.W.3. (SOUTHWARK).—Rehousing, Benfleet Place area; L.C.C. architect. (WESTMINSTER).—Flats (433), Glasgow Terrace site; city engineer. (CLAPTON).—Four-storey factory, Theydon Road; Sir E. O. Williams, architect, St. George's Road, S.W.1.

Lowestoft.—Houses (10), Long Road; S. J. Leaper.

Manchester.—Houses (100), Jubilee estate, Urmston; J. Barker, Rothiemay Road, Flixton. Houses (34), Victoria Avenue East, Stanage Avenue and Sidley Avenue, Blackley, for Greenwood & Tyson, Victoria estate, Rochdale Road; P. F. Kelvey, architect, 379, Moss Lane East. Tobacco factory, Wythenshawe estate; Gallaher, Ltd. Five schools, for the E.C.

Midlothian.—School, Newmills, Dalkeith, for County Council (£17,000); T. Bertram, County Council architect, 10, Drumsheugh Gardens, Edinburgh, 3.

Newburn-on-Tyne.—Houses, West Denton estate; C. F. Murphy, architect, Newgate Street, Morpeth.

Northampton.—Houses (16), Billing Road; E. H. Tibbs & Co., Ltd. Houses (40), Olney; R.D.C. surveyor. Offices, Drum Lane; Martin's Bank, Ltd. Extensions to works, Abbey Works, Weedon Road; Express Lift Co., Ltd.

Northumberland.—School, Tweedmouth (£23,960), for the County E.C.

Northwich.—Houses (118), three estates; U.D.C. surveyor.

Nottingham.—Cinema, St. Ann's Well Road, for A. H. Shapeero, "Elmwood," Elm Avenue, Beeston; Estates and General Purposes (Nottingham), Ltd., contractors, Burton Buildings, Parliament Street, Nottingham.

Nuneaton.—Houses (110), Vernon estate; borough engineer.

Paisley.—Additions and alterations (new laboratories, chemistry rooms, &c.) to Technical College and School of Art; secretary to Governors, Paisley.

Penmaenmawr.—Houses (28), Esplanade; Penmaenmawr and Welsh Granite Co., Ltd., Bangor Road.

Portsmouth.—Swimming baths and houses and shops, for the T.C.; H. E. Pitt, Ltd., builders, Leopold Street, Millfield, Sunderland.

Prudhoe-on-Tyne.—Houses (36), for the U.D.C.; W. Dixon and Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Quinton.—Houses (36), Rosafield Avenue; A. H. Field & Co., 137, Edmund Street, Birmingham, 3.

Rainham.—Factory, Ferry Lane; Murex, Ltd.

Ruislip.—Extensions to premises, for Wood Surrounds, Ltd., Braintree Road.

Selby.—Houses (128), Abbott's Road; U.D.C. surveyor.

Sheffield.—Houses (54), Kirkdale Drive and Kirkdale Crescent; C. S. Smith (Sheffield), Ltd., 11, Rural Lane.

South Shields.—Five schools, for the E.C. (£170,000); borough engineer. Alterations to Baring Street senior boys' school (£7,000); H. Hill, architect, 10, Winchester Street. Alterations to Westoe senior schools (£14,000); J. H. Morton and Sons, architects, Martin's Bank Chambers, Fowler Street.

Sowerby (YORKSHIRE).—Houses (32), for Thirsk R.D.C.; F. Pilkington, contractors, Leeds.

Sunderland.—Houses, near Ashbrooke Range and Glen Path, for R. Richardson; C. A. Clayton Greene, architect, Libden Gardens. Four-storey recreational centre, West Park (£110,000); O. H. Mark, Education Offices, John Street.

Tadcaster.—Houses (28), Nook Road, Arthurdale, Barwick; A. Chippindale & Son, Arthurdale Scholes.

Tooting.—L.C.C. hospital (£825,000); William Pite, Son & Fairweather, architects, 12, Carteret Street, S.W.1.

Uttoxeter.—Houses (112), Weaver Lodge estate; I. Banks, builder, Ecclesall Road, Walton, Stone.

Wakefield.—Offices, Westgate Street and Silver Street, for the Yorkshire Penny Bank, Ltd.

Wallsend-on-Tyne.—Houses and remodelling central and western schools, for the E.C.; J. A. Blench, borough engineer.

Warrington.—Houses (16), Cowdell Street; Ward & Lambert. Houses (12), Derwent Road; Wright Bros.

Washington.—Houses (28), Washington Station; L. T. Broome, U.D.C. surveyor.

Weardale.—Houses (20), Frosterley and Wolsingham, for the North-Eastern Housing Association; J. R. Ridley, architect, Council Offices, Stanhope.

West Ham.—Club, Custom House district; Bancroft's School Mission.

Whickham-on-Tyne.—Houses (54), Swalwell; U.D.C. surveyor.

Whitley Bay.—Cinema, North View, for the Capitol Cinema Co.; Dixon and Bell, architects, Pearl Buildings, Newcastle-on-Tyne.

Wigan.—Houses (42), continuation of Baytree Road, for J. Cottrill, Baytree Road; W. Meadows, architect, 70, Ellesmere Road.

York.—Houses (20), Whernside Avenue; H. Williamson. Premises, for Archibishop Holgate's school; governors. School, Margaret Street; St. George's R.C. trustees. Additions to Embassy Hotel, The Mount; T. F. Clark.

Yorkshire.—School, Ecclesfield (£38,614), for the West Riding E.C.